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ABSTRACT

This study attempts to estimate the federal resources required to fulfill the aspirations of Americans for post-secondary education and draws up 2 possible levels of support to be reached by 1976--one to meet the nation's minimum aspirations and one which is more likely to allow the poor to participate in post-secondary education. The report is divided in 4 parts. Part 1 discusses the benefits of higher education and examines the revolution in social demand for higher education. Part 2 summarizes the research on certain policies of post-secondary institutions. It also presents an analysis of the relation of institutional characteristics to admission policies and subsidies to students. Part 3 deals with graduate education and the pros and cons of general institutional aid. Part 4 is devoted to estimating financial needs of students and institutions, outlining a program and discussing various alternative levels of federal aid to higher education. Eight appendices containing mostly statistical data are attached. (AF)

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ASPIRATIONS, ENROLLMENTS, AND RESOURCES

The Challenge to Higher Education In the Seventies

by
Joseph
Froomkin

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Once again, it should be stressed that this is in no way an official statement of the policy of the U.S. Office of Education or the U.S. Government, but is merely a report on the research done in the Office of Program Planning and Evaluation.

JOSEPH FROOMKIN

August 1969

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Introduction and Summary

This study attempts to estimate the Federal resources required to fulfill the aspirations of Americans for post-secondary education. It draws up two possible levels of support for 1976: one just to meet the minimum aspirations of this Nation, $1.8 billion for student support, with possibly another $2.0 billion for institutional support; and another budget which is more likely to allow the poor to participate in post-secondary education on an equal footing with the well-to-do, equality of opportunity for the poor, $3.5 billion for student support, plus $4.5 billion in institutional aid. The rationale for these recommendations is summarized below.

Arguments for Federal Aid to Higher Education.—As the patterns of college attendance have changed, some of the more conventional arguments for Federal support to higher education have lost their cogency while others, mostly addressed to issues of social mobility and equality, are becoming more important.

Most of the validity is gone from the once commonly heard argument to justify Federal concern for higher education—the need to train a pool of highly skilled manpower to support the technological progress of our society. Since the original build-up of R&D expenses flattened out and increasing numbers of college graduates are entering the labor force, even such conservative projections as those of the U.S. Department of Labor, Bureau of Labor Statistics, are forecasting a slight surplus in the number of college graduates needed to man those jobs which were traditionally filled by college trained manpower.

If this argument is no longer relevant, there is still the claim that the productivity of college graduates is somewhat higher than that of noncollege graduates. Yet even here the argument appears to be strained. Unless capital accumulation is sufficient to allow labor's productivity to grow, such increase in productivity may not materialize. A recent cross-sectional study of increases in productivity tends to throw some question upon the role of highly educated people in increasing productivity. Other recent studies also indicate that ability rather than education may have played a greater part in determining productivity increases than was hitherto believed.

The proposition that individuals with more education are likely to adjust better to technological change, and hence to participate in the labor force for longer time periods, is somewhat more convincing. While a person with little education may feel defeated if he has to change jobs in his middle 50's, a person with a college degree is not likely to withdraw from the labor force.

A more telling argument is that higher education assists the social mobility of those whose parents are poor, assuming they are motivated to attend post-secondary institutions. In addition, subsidies to college students are likely to result in smaller absolute income differentials between incomes, if personal rates of return on investments for education remain constant and personal outlay goes down by the amount of the subsidy. It is quite likely also that the anticipated rate of return will decline as subsidies reduce the risks of undertaking post-secondary studies.

An increase in college graduates over and above the number required by a technologically advanced society is likely to have the additional benefit of equalizing incomes, promoting mobility, and helping achieve a society with fewer inequalities and tensions.

Another argument has been advanced in terms of overall efforts to improve the quality of life, that is, that the United States can afford to extend higher education to an increasing number of students because of the affluence of the society. Although this is a social rather than an economic argument, it does have merit in promoting the aspirations for a better America. At the same time we should not overlook the fact that by investing in higher education we may have to forego spending money on something else.

In the short run, with scarce Federal resources, it is important that the Federal Government concentrate on supporting those activities which are least likely to be financed by individuals, institutions, and States. The Federal interest should include not only the quantity of education, but its quality as well. (Chapter 1)

Changes in Aspiration to Post-Secondary Education.—While college attendance increased proportionately for all income groups between 1940 and 1960, propensities to attend college have changed dramatically between '60 and '69.

This is what has happened so far:

- Between 1939 and 1959, young people from all income groups increased their aspirations to attend college at a uniform rate.
- Between 1960 and 1966, a new trend started manifesting itself. The aspirations of the poor to a college degree began to catch up with those of the rich. Twice as high a proportion of high school seniors from the lowest income quartile hoped to attend college in 1966 as did in 1959. The increase was from 23 percent to 46 percent. The proportion of high school seniors from families in the second income quartile —families whose income is below the median— who expected to enroll in college rose from 40 percent in 1959 to 52 percent in 1966. This was an increase of 30 percent. The desire to attend college grew more modestly in the upper two income quartiles, from 52 percent to 65 percent of seniors in the third quartile, and from 68 percent to 74 percent of those in the highest quartile in 1966.

These changes in expectations are reflected in enrollments. We estimate that 230,000 more freshmen enrolled in college full time in the fall of 1968 than would have been expected if the trend of 1956-65 had been followed. About 65,000 of these freshmen enrolled in college full time in the fall of 1968 $5,000 a year, the bottom quartile of the income distribution. Another 61,000 came from the second quartile. Altogether, 217,000 out of the quarter million total increase in enrollments came from other than the traditional sources of college students in the 1950's.

The increasing rate of post-secondary school attendance by students from poorer families became apparent soon after the enactment of the Higher Education Act of 1965. During the academic year that began in 1966, some 900,000 students received financial assistance under one or more of the Federal aid programs administered by the U.S. Office of Education. During 1968-69, the number of young people aided by Office of Education programs alone is expected to exceed 1.5 million students. Meanwhile, considerable additional aid is also available through the Veterans' Administration. The Veterans' Administration will have contributed $323 million to student finances in the academic year 1968-69, and expects to increase this aid to $425 million in the academic year starting in September 1969. (Chapter 2)

Projection of Enrollments to 1976.—The Office of Program Planning and Evaluation has projected two possible levels of enrollment in post-secondary education between this year and 1976. Both projections are based on a model which takes into account the dynamic changes in the desire to go to college by income and ability quartile. The first projection, referred to for convenience as the OPPE Model, projects attendance rates by income and ability quartile, using past trends, to arrive at the estimate of 8.5 million full-time equivalent students in 1976. The second projection, referred to as the "complete equality projection," estimates enrollments in 1976 at 9.2 million full-time equivalent students. The attendance patterns used in the latter projection are based on the assumption that all income groups will match the attendance patterns of the upper income quartile. This estimate can be taken as an upper limit of the possible enrollment given unlimited availability of student aid. Even the lower projection is .4 million students higher than the National Center for Educational Statistics estimates for that year. This lower projection implies that not all students who wish to enroll in post-secondary education are likely to be afforded this opportunity, if other things remain equal. (Chapter 3)

Institutional Characteristics.—After considering the developments in student enrollments, this report examines certain features of the post-secondary system. It was surprising to learn that course offerings in central cities, other urban areas, and non-urban areas do not differ much either by subject matter or level (graduate or undergraduate). By contrast, the courses do differ according to day or night offerings. Science courses, for example, are less likely to be offered at night than during the day. Another striking finding uncovered by the study is that private universities offer roughly one-third of their courses at the graduate level as compared to one-fourth for public universities. In the Nation, as a whole, 18 percent of the total course offerings are at the graduate level.

The variety of levels at which courses are offered has crucial impact on the costs incurred by a school. A study of instructional costs incurred by 14 colleges and universities in the Oklahoma State system, for example, pointed up important differences in the expenditures per credit hour for science and non-science courses, as well as for similar courses according to level. Lower level undergraduate courses in science were found to be only half as expensive as upper level undergraduate offerings. Graduate courses in science cost the institution roughly 4 or 5 times as much as lower level undergraduate courses. In the non-science field, the difference is somewhat less pronounced, and the overall costs are somewhat lower.

A comparison of costs in the Oklahoma State system between 1961 and 1967 indicated that prestige institutions increased their outlays during this period somewhat more rapidly than did average colleges. An analysis of expenditure developments throughout the United States by type of school for the periods 1961-62, 1963-64, and 1965-66 showed first, the range of costs incurred within a given type of institution is extremely wide. Second, the educational costs (instructional costs and some additional outlays for libraries, faculties, etc.) per standard undergraduate student have fallen in six out of eight classes, in constant dollars between '61-'62 and '65-'66. For all institutions, in constant dollars, these costs declined some 6 percent. This may be an interesting clue to the economic causes of the unrest on the campuses.

In analyzing the causes for student unrest, the findings about the level of subsidy which schools offer to the average student may also be relevant. While tuition costs went up, the subsidy per student remained fairly constant between 1964 and 1966. This is an important finding both in understanding the financial pressures on schools and for projecting future deficits. (Chapter 4)

Quality in Higher Education.—A number of studies have attempted to relate resources to outputs in higher education. Most of these studies have indicated that this relationship is at best a tenuous one. Nevertheless, the Office of Program Planning and Evaluation last year attempted once again to discover the relationships between student inputs and outputs. The desirable output was set unconventionally as the percent of college seniors going on to graduate school. In other words, it was assumed that the thirst for further knowledge imparted to college graduates was a measure of the school's success. An additional measure—the number of Ph.D's produced in relation to the number of graduates—was also used as a mark of quality.

After school inputs were adjusted for the ratio of males enrolled in the total student population and the percentage of students with majors in education, it was concluded that the selectivity of the school, i.e., the ability of students, played a determining role in explaining the percentage of students going on to graduate schools as well as the production of Ph.D's. This factor is much more important, if regression coefficients are to be trusted, than expenditures per student. In other words, the findings collaborate those of other studies. The policy implication of this finding is that recruitment is likely to contribute more to excellence than an increase in outlays. (Chapter 5)

Costs and Ability.—Colleges and universities which cater to more gifted students spend much more per student than those which enroll students with low SAT scores. A special study which looked at variations in expenditures in 1961-62 and 1965-66 in 70 small schools and 31 large universities explained 50 percent of the variation by the SAT scores of entering freshmen. If anything, the gap between what was being spent on gifted students and less able ones has widened between 1962 and 1966.

The studies indicated that the expenditures per average freshman increased by $100 between 1962 and 1966. For the gifted freshmen, however, the increase in expenditures was $333. Furthermore, the difference between the educational costs incurred by the school and the tuition is positively related to the ability of the student. If this analysis is correct and the majority of high-scoring freshmen come from well-to-do families, it would appear that the wealthy were being subsidized more as time went on. (Chapter 6)

Admissions Policies and Growth.—A comparison of the admissions policies of 100 schools in 1961-62 and 1965-66 indicated that the standards for admission had not changed drastically during that time period. Despite the precipitous growth in enrollments of 45 percent between 1961-62 and 1965-66, most talented students still managed to find places in quality schools. It was concluded also that much of the increasing enrollment consists of students with low SAT scores who were accommodated by institutions which accepted freshmen of similar ability before enrollment pressures developed. In other words, quality institutions which have not changed their standards appreciably grew only as rapidly as the supply of talented freshmen increased. This growth of enrollment, 12 percent, was much less than the 28 percent growth of institutions which catered to the average student. New institutions which catered to less academically attractive students were established during that period to accommodate a new wave of enrollments. (Chapter 6)

Graduate Education.—The socioeconomic origins of graduate students satisfy the equality of opportunity criteria better than do those of undergraduates. On the average, the social origins of graduate students are somewhat more modest than those of students pursuing a B.A. Part of the reason for this seeming anomaly is the popularity of graduate programs among teachers, a group which generally comes from a below-average socio-economic background.

Our studies have indicated that aid to graduate students was unevenly distributed, at least in the mid-1960's. Stipends and fellowships were more easily available to students in the sciences than in the humanities or the liberal arts. A "C" student in the sciences was much more likely to be supported in his graduate career than one pursuing a non-science major.

In the past few years these inequities have been partially corrected, both by the somewhat more generous and catholic policy of the Office of Education, and by the non-restricted grants of the Veterans' Administration.

We believe that the more able students were already adequately supported by graduate fellowships in the late 1960's. Whether this trend is going to continue to the 1970's depends on two factors: (1) the funding of research and development activities in universities; (These funds are an important source of earnings for many graduate students.) (2) the availability of Veterans' Administration funds to finance the increasing enrollments at the graduate level.

Our recommendation for the future financing of graduate education is modest. It would double the moneys spent for graduate students' support in line with the growth of enrollment and cost of living increase.

The impact of graduate students on university finances is quite another matter. Graduate education is much more expensive than the education of undergraduates. It is estimated that 40 percent of the instructional deficits in universities are caused by graduate students. To preserve quality in institutions of higher education, under those circumstances, it may be necessary for the Federal Government to step up institutional grants that are tied to graduate student attendance, irrespective of whether those students are maintained through Federal stipends or continue their education as a result of part-time enrollment (much of which is made possible by Government R & D funds).

In this connection we have recommended that a national commission be established to examine the priorities for the establishment of strong graduate schools in a variety of disciplines. This commission would then decide how a major congressional appropriation, between three and five billion dollars a year, should be distributed among centers of graduate excellence. (Chapter 7)

The Case for General Aid.—In the light of the above findings, a number of proposals for general aid to institutions of higher education were examined. This study examined the possible impact of the Miller Bill, the Bowen Growth Formula, the New York State Committee Formula, the Basic Enrollment Formula, Farrell-Anderson Growth Difference Formula, the Carnegie Commission Proposal, and differential institutional payments based upon the affluence of the students. We found that the impact of these general aid proposals was likely to be quite similar for most institutions. Roughly 11 percent of the amount would go to students in the lowest income quartile and roughly 40 percent of the benefit would accrue to students in the upper income quartile. Given the conjectural nature of the data on which the allocations were based, it is difficult to champion one formula over another. (Chapter 8)

Required Student Aid.—The amount of aid which will be required to equalize educational opportunities in the United States will depend to a large extent on the definition of the equality of educational opportunity. In this paper, two definitions of equality of educational opportunity were adopted: (1) That every high school senior who wished to attend a post-secondary institution should be afforded the money to do so, given present patterns of full-time and part-time attendance. (2) That every high school student regardless of family income should be encouraged to attend post-secondary institutions in the same pattern as children from upper income quartile families.

Even with those restrictive assumptions, it is not at all clear how much money is really needed to attain these targets. Should the grants be equal to the average expenditure for college education by income group, or should they be equal to some other standard necessary to attend a two-year college during the freshman and sophomore years and the four-year public institutions later? Or, perhaps they should be set at what students actually spend? Quite different answers are obtained depending on what standard is used. For the OPPE projection, if average expenditures are taken into account and present enrollment trends are followed, the amount of money required to finance undergraduates is estimated at $1.4 billion in 1976. If the standard is set at the average cost of attending public institutions, the 1975-76 level reaches $2.2 billion. Similarly, as much as $2.2 billion may be required by 1975 to finance the enrollments if the actual costs are taken into consideration.

The results of this last projection are most interesting. They indicate that the rapid rates of growth of tuition and living costs at quality colleges are putting an unusually heavy burden on parents in the upper half of the income distribution whose children patronize these institutions. The rate at which average family contributions fail to cover these increasing costs is growing even faster than student aid needs for children of families in the lower two quartiles of the income distribution. By 1976, roughly $0.5 billion will be required by children from families in the upper two quartiles as contrasted to $1.6 billion for children from families in the lower half of the income distribution. This contrasts with some $300 million and $1.0 billion for the same two income groups respectively in 1969. (Section 9)

Institutional Deficits.—Increasing levels of tuition are not likely to compensate fully for the combination of increased costs of education and increased enrollments between now and 1976. The educational deficit on current accounts is likely to increase from an estimated $3.5 billion in 1965-66 to $5.3 billion in 1970-71, and grow to $8.1 billion in 1975-76, if the lower projected levels of enrollments materialize, and will be one billion dollars more if sufficient money is available to induce students from the lowest income quartile to attend at the same level as high quartile students. (Chapter 10)

Conclusions.—In a period when the function of the post-secondary system is being questioned, this monograph has struck an old-fashioned note of concern about the financial arrangements needed to maintain the revolution of rising expectations. Student financial aid, the first Federal priority, will have to grow quite substantially to $2.2 billion for undergraduates, and an additional $0.8 billion for graduates by 1975-76.

If more ambitious goals of providing relative equality in educational opportunity are set by the Federal Government, the total bill for student aid may have to increase to $3.9 billion for undergraduates, and $1.0 billion for graduate students. The additional $2.0 billion in aid should cause 390,000 more full-time equivalent students to enroll.

We have shown that the present structure of the income tax would make it possible to finance a large institutional aid program and still equalize the incidence of subsidies and burdens by income quartile. Such a general aid program can be instrumental in equalizing the resources in schools attended by children with various social origins. If the general aid is high enough, it may reduce the burdens which higher costs in undergraduate education are placing on the middle class.

Ideally, in order to forestall a middle-class revolt against higher tuition, the Federal Government may wish to contemplate a $4.5 billion aid program to institutions, 60 percent of it allocated on a *per capita* basis, and 40 percent tied to graduate and professional school support. In effect, the Federal Government would thus cover roughly one-third of the institutional deficits on current and capital accounts caused by instruction and allied outlays, and thus reduce the rising pressure on quality institutions to finance graduate education.

Whether a smaller institutional aid program should be contemplated before all student aid needs are met is controversial. A smaller aid program, say $2.0 to $3.0 billion, can be advocated if the Federal Government decides that it has a responsibility to provide the resources to educate students. The counter-argument is that the States will be able to provide the money if the students appear at the college door. This is clearly a political judgment.

The study does not discuss a number of subsidiary programs, such as aid to developing institutions, Talent Search, Upward Bound, or special recruitment programs for disadvantaged students by graduate schools. The moneys needed for these programs are dwarfed by the requirements for student and institutional aid.

When it comes to construction aid, we would lean to providing some money for this purpose only in the absence of a general aid program. If fiscal pressures on State and private resources can be reduced in the area of operating funds, it will be easier to find construction money from non-Federal sources.

The recommendations tally closely with those of the Carnegie Commission on Higher Education and a report by a group of Federal officials, "Toward a Long-Range Plan for Federal Financial Support for Higher Education," when assumptions are made about an "optimal world." The Carnegie report calls for $9.1 billion in Federal expenditures (excluding outlays for research) in 1976-77 ($9.4 billion in 1975-76), and the Federal report calls for $8.0 billion. Recommendations in these reports amounting to roughly a billion dollars are outside the scope of this paper. For optimal conditions, we would recommend a Federal program of $3.4 billion for student aid, and $4.5 billion of institutional aid. This compares with $3.4 billion of student aid under the Carnegie proposal and $3.8 million under the Federal proposal.

This paper also analyzes programs that we can live with, and at the same time meet the aspirations of most Americans in a less-than-"optimal" world. In all probability, the Federal Government can "make do" with appropriations of $1.8 billion for student aid, and $2.0 billion for institutional support. These lower figures are conditioned on the establishment of channels to provide loans to students.

Since aid cannot be targeted as effectively as under our assumptions, it would be prudent to provide for a 15 percent additional level in grants, and 30 percent more in loans.

Part I

The first part of this study discusses the possible benefits of post-secondary education, and goes on to examine the revolution in social demand for higher education, which has resulted in higher expectations by the children of the poor to attend college. The demand for post-secondary education is projected to 1976 on the assumption that the aspirations of the poor for a college education will be met.

1. Purposes of Higher Education Aid

When asked why he climbed the Himalayas, a noted mountaineer answered with puzzlement, "because they are there." The postulates of Federal aid to higher education are no more rational than the mountain climber's desire to master the highest peaks in the world. They have much else in common. Both the mountains and the system of post-secondary education have been with us for a long time. Both mountains and universities are, for the most part, esthetically pleasing—they are perhaps the most attractive parts of our natural and itellectual environment. Yet, to avoid false sentimentality, we ought to examine very closely the purpose of our aid to post-secondary institutions. This type of examination may very well help to devise better, newer and most effective vehicles for aid.

Arguments for Federal Aid Summarized.—What are the arguments which bolster Federal concern for higher education? Probably the most common is the contention that higher education produces a pool of highly skilled manpower needed to support the technological progress of our society.

The second argument, closely related to the first, is that additional education enhances the effectiveness of the labor force, makes it more productive, and hence adds to the gross national product. It has been stated that the general welfare is increased especially because of the knowledge produced in the higher education sector.

The third argument which has been advanced to justify Federal aid to higher education is that post-secondary studies are an avenue of social mobility, and that it is reasonable for the Federal Government to remove the barriers to upward advancement that exist because of low parental incomes.

A fourth argument for Federal aid is based on more sophisticated premises. It states that part of the return in terms of higher incomes to persons attending post-secondary institutions results from: (1) their investment in more education, (2) their superior ability, and (3) shortages of persons with these skills. Therefore, in order to approach a more equal distribution of income, the Federal Government should reduce the shortage of highly educated people.

Another argument cogently submits that intellectual excellence in a society depends on a strong post-secondary education system. This non-economic argument for Federal aid to higher education may be developed along the lines of one of the more frequently stated purposes of the public school system, that of citizenship building. Colleges and universities are expected to shape the future leadership of this society. The U.S. Congress has emphasized this position by passing a higher education student aid amendment which provides for withholding aid to students who are convicted by the courts in the course of campus protests.

The following pages examine these five arguments in greater detail.

Manpower Requirements.—The argument that highly educated manpower is required to operate the increasingly complex technological society has been voiced by a large number of people. Cross-sectional data do not seem to substantiate this point. Studies of employment changes between 1950 and 1960 indicate that industries with higher rates of growth in output per worker did not increase their employment of skilled or white-collar workers any faster than those where productivity increased more slowly (see Tables 1-1 and 1-2).

TABLE 1–1.—*Percent of White-Collar Workers by Changes in the Rates of Growth of Output Per Worker, 1950 to 1960*

Industry Class	Per Cent White-Collar Workers	Per Cent of Workers Under Age 35
Change in O/W under 2%		
Increase in emp. under 15%...	36	37
Increase in emp. 15+%.......	50	38
Change in O/W 2.0 to 3.9%		
Increase in emp. under 15%...	33	36
Increase in emp. 15+%.......	54	41
Change in O/W 4.0+%		
Increase in emp. under 15%*..	24	34
Increase in emp. 15+%.......	53	43

* Excluding agriculture.

Source: A. J. Jaffe, and J. Froomkin, *Technology and Jobs*, Frederick Praeger, New York, 1968, p. 88.

Table 1-2.—*The Proportions of Skilled, Semiskilled and Unskilled Workers to Total Production Worker Employment in 1950 and 1960 in Manufacturing Industries*

Av. annual per cent change in output per worker	Skilled	Semiskilled	Unskilled	Total
0-1.50				
1950	42.3	44.6	13.1	100.0
1960	42.9	47.3	9.8	100.0
1.51-2.50				
1950	27.4	63.2	9.4	100.0
1960	28.2	63.8	8.0	100.0
2.51-3.50				
1950	16.5	68.4	15.1	100.0
1960	18.1	71.5	10.3	100.0
3.51-4.50				
1950	26.8	65.9	7.3	100.0
1960	28.0	66.8	5.2	100.0
4.51+				
1950	21.1	70.5	8.4	100.0
1960	28.5	65.3	6.2	100.0

Source: A. J. Jaffe, and J. Froomkin, *Technology and Jobs*, Frederick Praeger, New York, 1968, p. 264.

The proportion of professionals in the labor force increased substantially only in those industries where there was considerable investment in research and development activities (both government and private), such as the aircraft, electronics, and chemical industries (Appendix A Table A-1). In fact, the total number of scientists in industry and business scarcely increased from 1962 to 1968 (see Table 1-3).

Currently, we have very little evidence that the present level of technological change needs to be supported by even higher levels of education. On the other hand, there may be a need for more education in society in order to better equip workers to shift to new jobs, perceive new needs and opportunities, and achieve greater adaptability and readiness to learn. There is, however, little evidence of any urgent need to encourage higher education to make progress possible. This conclusion is supported by Denison's studies of European countries in the post-war period, where he found

Table 1-3.—*Characteristics of Scientists in the United States, Type of Employer, and Primary Work Activity, 1962 and 1968*

	1962		1968	
	Total No.	Percent	Total No.	Percent
Type of Employer				
Educational Institutions	60,319	28	117,746	40
Federal Government	24,962	12	29,666	10
Other Government	12,031	6	10,031	3
Military	4,415	2	7,155	2
Non-profit	9,445	4	11,204	4
Industry and Business	90,800	42	95,776	32
Self-Employed	5,095	2	6,462	2
Other	3,936	2	1,729	1
Not Employed	3,439	2	12,707	4
No Report	498	..	5,466	2
Totals	214,940	100.0	297,942	100.0
Primary Work Activity				
Research and Development	75,679	35	96,036	32
Basic Research	32,744	15	46,177	15
Applied Research	31,382	15	38,841	13
Management or Administration	48,226	22	62,870	21
Management or Administration of Research and Development	27,852	13	28,568	10
Teaching	33,907	16	62,087	21
Production and Inspection	18,778	9	16,847	6
Other	31,032	14	35,115	12
Not Employed	3,439	2	12,707	4
No Report	3,879	2	12,280	4
Totals	214,940	100.0	297,942	100.0

Sources: National Science Foundation, *National Register of Scientific and Technical Personnel*, 1962, and *Reviews of Data on Science Resources*, No. 16, December 1968.

very little relation between increases in educational levels of the labor force and productivity changes during those years.[1]

Role of Government in Solving Shortages.—The argument that the Government must take a hand in solving shortages in given occupations has had several facets, only one of which is valid. There is some justification for the Government's concern with expanding training for particular occupations in which there are shortages and incomes are high. For example, in the medical profession, among the reasons for high incomes are the small number of medical schools and their limited capacity, the high costs of medical training, and the lengthy process of internships and residencies that are required for professional certification. By contrast, in other occupations such as computer programming, salaries that are currently high may be expected to be reduced because of the market forces that are at work. The high salaries attract persons to the occupation, and the relatively short training period will make available an increase in the supply of computer programmers in the near future. Such an increase in supply has the tendency to reduce the income from that occupation.

Looking to the near future, the United States in 1975 may be faced with a surplus of persons having a college degree, in terms of present education standards for jobs. The number of college graduates in the labor force, according to the Bureau of Labor Statistics, is likely to be 12.4 million. The demand, based on a generous extrapolation of industry growth and utilization, is projected at 12.2 million.[2] More pessimistic forecasts about the supply and demand of college graduates place the surplus at somewhat over a million in 1975.[3]

If present occupational standards for employment of these workers are maintained, a small surplus of college graduates is likely. This surplus is not substantial and may not be readily apparent if college graduates displace people with some college training, and those with some college then take jobs formerly performed by high school graduates. In summary, the shortage of manpower argument has only limited applicability as a basis for Federal policy.

Productivity, Labor Participation and Education.—The corollary argument that post-secondary education increases the productivity of persons is partially true. It has been observed that persons with college degrees have higher starting salaries, steeper increases in income, higher participation rates in the labor force, and later retirements. At the same time, there are substantial costs of higher education that include opportunity costs, late entrance into the labor force, tuition, etc.

It is not at all clear, though, how much of the increased wages received by college graduates is due to their higher ability levels, how much is due to scarcity, and how much can be ascribed to the benefits of education itself. Some preliminary studies by Cutwright[4] indicate that possibly as much as one-third of the salary differential may be due to different levels of ability. This is much more than has been estimated by Becker in his studies of returns to post-secondary education.[5] Without more detailed information there is no way to estimate these differentials. If the preliminary estimates are correct, investments in conventional capital are likely to be as productive as investments in people, and the second argument does not provide a rationale for Federal aid to higher education.

Social Mobility.—This argument has two facets. The first, that of equity, argues that children of equal ability ought to have equal opportunities in obtaining an education. The second stresses democratization of education as a factor in social stability. As our society becomes more affluent, more and more parents desire some college experience for their children. Denying these expectations may very well create social stresses detrimental to the fibre of this democracy.

The reasonableness of both facets of this argument cannot be denied. Yet, once it is accepted, it should be realized that if money is spent on higher education, it is not spent on something else. If the capital stock of a country is to suffer as a result of over-investment in education, economic growth may be retarded. To what extent one may wish to trade off economic growth as against social stability is a value judgment. On the other hand, judicious fiscal policy which raises money in such a way as not to impinge investment may very well reconcile those two opposing concerns.

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[1] Denison, Edward F., *Why Growth Rates Differ*, Brookings Institution, 1967.

[2] Rosenthal, Neil H., and Hedges, Janice Neipert, "Matching Sheepskins with Jobs," *Monthly Labor Review*, Volume 91, No. 11 (November 1968), p. 10.

[3] Jaffe, A. J., and Froomkin, J., *Technology and Jobs*, Praeger, 1968, pp. 157–158.

[4] "A Pilot Study of Factors in Economic Success or Failure, Based on Selective Service and Social Security Records," by Phillips Cutwright, Washington, D.C.: Department of Health, Education, and Welfare, Social Security Administration, Division of Research and Statistics, 1967.

[5] Becker, G. S., *Human Capital, A Theoretical and Empirical Analysis with Special Reference to Education*, Princeton University Press, 1964.

Equality of Incomes.—The argument to the effect that subsidies to higher education are justified because they will reduce income disparities can be divided into two parts. First, subsidies to education should be distributed in such a way that the returns to the individual grow less with every additional increment in educational attainment. In other words, the rate of return to the individual on the investment in a college education should be less than that of a high school education, and the returns from graduate school should be less than those from an undergraduate degree. If this is achieved, income disparities in society will be reduced.

To bring about this state of affairs, a first necessary step is to reduce the scarcity of persons with higher education. It is unlikely that shortages can be eliminated unless higher education is subsidized quite heavily. A subsidy program would attract more people into higher education and thus increase the supply of college trained people and thus reduce some of the current income inequalities.

Such a program would also reduce the investment costs of the individual student. These are substantial at higher educational levels since they include the foregone income of the student—a sizeable sum for a high school graduate.

Two consequences of a subsidy program for higher education would tend to reduce income disparities. They are: (1) an increase in the desire to enroll in a higher educational program; and (2) a reduction in the risk of dropping out of the program because of a shortage of money. By contrast, the lower level of income due to the increase in the supply of college trained persons may act as a disincentive to potential higher education students. A more detailed explanation of this model appears in Appendix A.

If public policy is to reduce income disparities between those who attend or graduate from college and those who do not, we are likely to have a more egalitarian society. This may be a desirable goal for social policy, but is not without certain attendant risks. For instance, unless tomorrow's egalitarian society confers high status upon occupations with high training content, the small differential in incomes will discourage some bright people from attending post-secondary institutions.[6] The prospect of a talent loss caused by smaller income differentials is a real threat.

The Quality of Life.—The success of higher education in furthering leadership could perhaps be measured by indicators in the same way that voting rates measure participation in civic activities. Assuming these to be valid measures, one could assess the success of the higher education system according to geographic location, political beliefs, religious background, etc. This possibility is recognized here, but translating it into operational terms is beyond the scope of the current study.

The contribution of higher education to the Nation's intellectual excellence is even more difficult to assess. Its existence would argue for limited aid to selective institutions of higher learning.

It is very easy to make an argument that only the best institutions with the brightest students and the most brilliant professors ought to be subsidized. The percolator theory of excellence does not make much sense, i.e. getting masses of people involved in post-secondary education is not an efficient way to create excellence. Intellectual climate and style are nurtured in a limited number of institutions, and a dispersion of talent is not likely to create excellence. On the contrary, it is likely to thwart it. Taking this argument to its logical conclusion requires that a special vehicle for rewarding excellence should be developed by the Federal Government.

Some Policy Criteria.—If one were eclectic in choosing the reasonable parts of each of the five arguments, one might come to the conclusion that Federal policy ought to stress the increased availability of college education in general and of graduate studies for certain shortage occupations. The programs should be so administered as to shelter areas of intellectual excellence from some of the more mundane pressures of day-to-day changes in social policy. Care should also be taken that the quality of instruction does not vary by social class. The goal of equalizing attainment for persons of different ability, which has motivated compensatory and remedial instruction on the elementary and secondary level, should also motivate the higher education establishment.

In terms of more specific programs, the objectives can be implemented by the following measures: (1) Extend the opportunity to attend colleges and universities to a larger proportion of youths from lower income families. (2) Increase the average quality of content of units of instruction offered, especially to poorer and less able students. (3) Increase the opportunities for graduate study in specialties which are either scarce or oriented to the public sector. (4) Change the relative amounts of instruction undertaken in specific subject matter fields to increase the relevance of higher education to orient college to improve the quality of life.

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[6] The policy implications of offering at the same cost training programs of differing social values are beyond the scope of this study. An academic writer should examine them closely.

Each of these objectives is significant to the future economic and social growth of the United States. Each is competitive with the others, since with limited resources one objective may be advanced only at the expense of the others. The role of the Federal Government in the post-secondary educational world is to provide judicious subsidies in such a way that socially desirable levels be reached, levels which will not be reached without Federal Government intervention. In choosing funding levels for programs one must decide what is the relative importance of each objective, at which level subsidizing this objective may become crucial, and how effective is a given form of Federal assistance in meeting the objectives to which it is addressed.

2. Aspirations and Demand for Post-Secondary Education in the Mid 1960's*

In 1964 two Columbia University researchers, Jaffe and Adams, discovered a principle governing college enrollments. After analyzing the educational attainment of Americans between 1880 and 1950, they deduced that higher education enrollment was directly proportional to the number of high school graduates. The Jaffe-Adams principle stated that roughly five out of ten white male high school graduates were likely to enroll in some post-secondary institution and that the ratio was four in ten when applied to white females. This ratio held fairly constant with only minor variations from 1880 through 1950.

No sooner had the two researchers stated this principle than the Federal Government introduced radically new legislation to encourage attendance at post-secondary institutions. The aspirations of the population and the character of the post-secondary institutions changed drastically. Since then, there are indications that the principle has stopped operating.

A survey of aspirations of parents and high school seniors in 1965 and the subsequent enrollment in post-secondary institutions in 1967 currently indicates that roughly six out of ten males are likely to enroll in some post-secondary institution in the late 1960's.

Jaffe and Adams, who analyzed this second survey as well, also found that the aspirations by income group had changed significantly between 1959 and 1965. While college enrollment intentions between 1939 and 1959 increased equally for all income groups, in 1965 the children of poorer parents planned to attend college at twice the rate of 1959, while college attendance intentions of the children of the rich increased only 6 percent.

This section summarizes the findings of Jaffe and Adams on college attendance trends between 1880 and 1950, discusses the aspirations of the parents of college seniors of the class of 1966, follows them into college as of February 1967, and describes the characteristics of college students during the mid-60's.

It depicts a revolution in expectations which is likely to democratize participation in higher education. The extent of such democratization would seem to depend in large part on the amount of student aid available, and on continued expansion of low-cost, liberal-access colleges (chiefly public two-year community colleges) in the years ahead. The work of Jaffe and Adams is supplemented in this section by some analyses drawn from Project Talent data which describe the college experience of children of the poor, the middle class, and the rich.

Attendance and Retention at Post-Secondary Institutions, 1880 to 1960

Since high school graduation is normally a prerequisite to college attendance, it is not surprising that post-secondary enrollments and high school graduation are closely related. What is surprising is that for the period between 1880 and 1960 a fairly constant ratio of high school graduates enrolled in college.

Throughout the period 1880 to 1920, approximately half of the white male high school graduates entered college. During the Great Depression of the Thirties and during World War II the ratio of high school graduates entering college dropped slightly. It reached a low of four out of ten in 1935, and recovered to the five out of ten level by 1945. As far as can be judged, in the early 1950's and around 1960, college attendance patterns pointed to the continuation of the same five out of ten enrollment rate. It is difficult to be precise about the developments in the recent past because some of the high school graduates of the early 1960's will not enroll in college for the first time until some 5 to 15 years after graduation.

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* This section is based on the work of A. J. Jaffe and Walter Adams. Some of it has been previously published in the *College Board Review*, Winter 1964–65 issue; *The American Journal of Economics and Sociology*, Volume 23, No. 1, January 1964; and special work done for Dr. Jaffe and Mr. Adams by the U.S. Bureau of the Census under OE grant No. OE–6–10–039. The authors of the study have made available the unpublished information to the Office of Program Planning and Evaluation which has summarized it.

Among non-white males, the college attendance pattern for high school graduates was similar to that of white males prior to the middle 1910's. After that date, concurrently with an increase in the proportion of non-whites graduating from high school, the rate declined to nine in twenty. It is significant that in a period when high school graduation rates increased significantly for both the white and non-white population (it went up from roughly 20 to 65 percent for white males and from 10 to 35 for non-whites between 1920 and 1955) the proportion of white males who entered college remained relatively constant, if one compensates for the effects of the Depression and the War, while that of non-white males appears to have declined slightly (see Figure 2–1).

From 1880 through 1950, four in ten white and non-white female high school graduates entered college. Until the mid-1920's, more non-white female high school graduates went to college compared to white females. During the 1930's, the rate for both whites and non-whites decreased by one-third, and stayed that way during the 1950's. There is some evidence that enrollment rates for white females have returned to the four in ten ratio. The 1960 census statistics, on which this analysis is based, do not permit a similar conclusion about non-white females. Whether the rate of attendance of non-white female high school graduates is also on the upswing cannot be estimated from that data, because delayed entrants are more common among Negroes compared to whites (see Figure 2–2).

The retention rate in college was practically constant for the period 1880 to 1930 for white males, with slightly more than half of the entrants graduating from college. In the immediate period after World War II there was a temporary upswing in graduation rates—up to close to six out of ten. In the case of white women, roughly four out of ten of each age-cohort graduated from college.

For non-white men, slightly more than nine in twenty are likely to complete four years of higher education. The graduation rate of non-white women is slightly higher than that of white women (see Figure 2–3).

The historical analysis indicates that there has

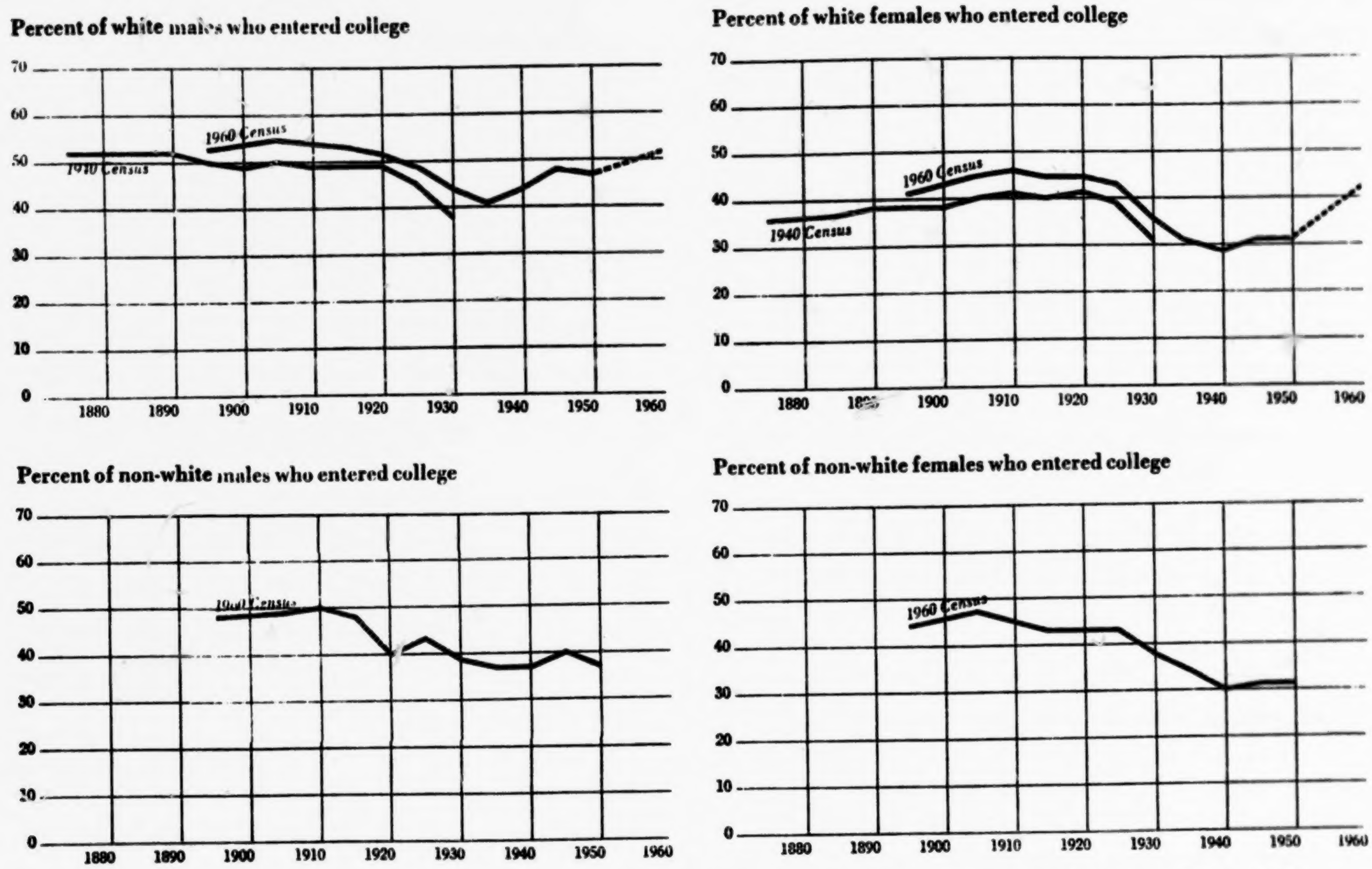
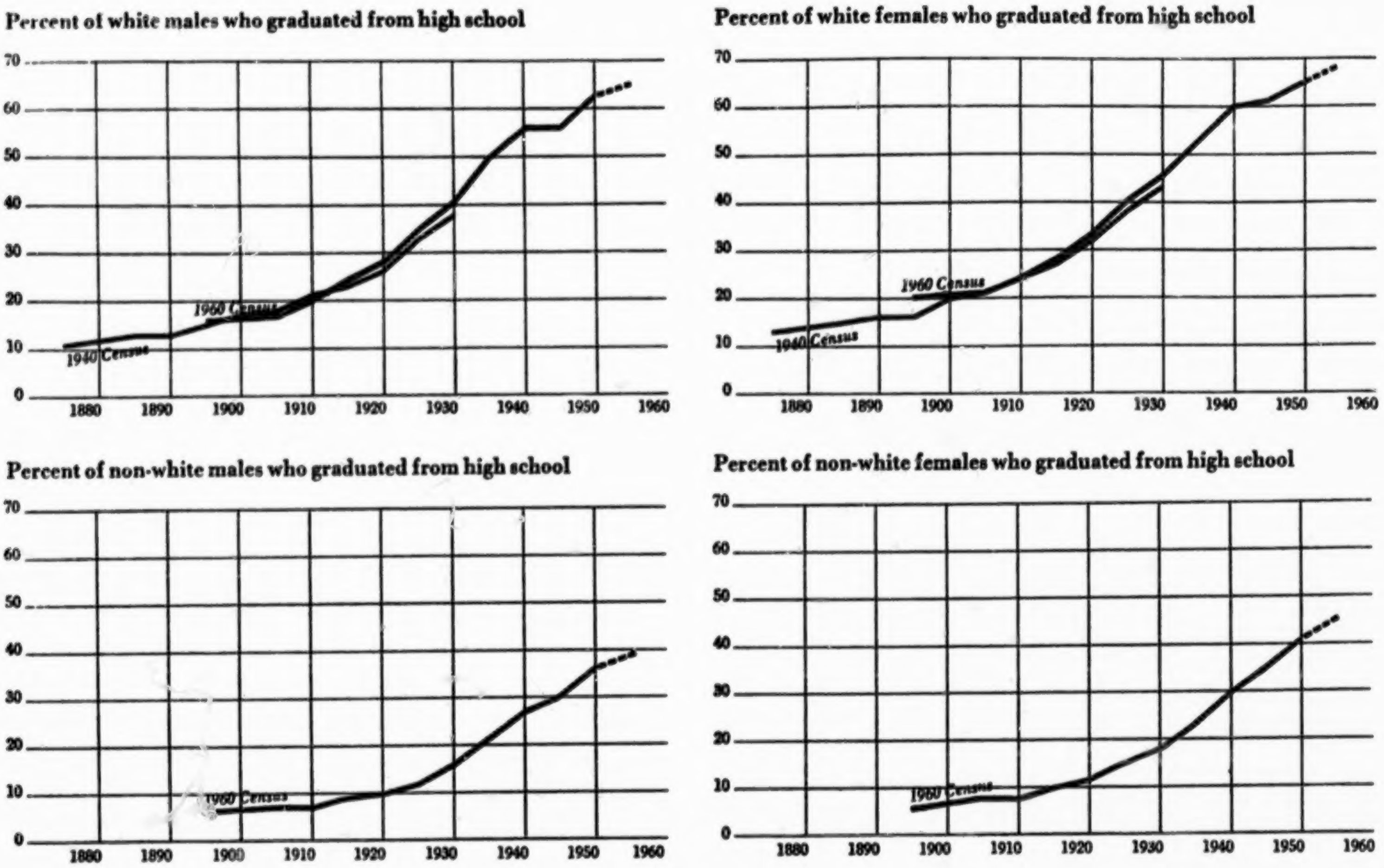


FIGURE 2–1.—*Percent of Males and Females who Attended Post-Secondary Institutions, 1880–1950*

Source: A. J. Jaffe and Walter Adams, "Trends in College Enrollment," *College Board Review*, No. 55, Winter 1964–65, P. 29.



Percent of white males who graduated from high school

Percent of white females who graduated from high school

Percent of non-white males who graduated from high school

Percent of non-white females who graduated from high school

FIGURE 2–2.—*Percent of Males and Females who Graduated From High School, 1880–1955*

Source: A. J. Jaffe and Walter Adams, "Trends in College Enrollment," *College Board Review*, No. 55, Winter 1964–65, P. 28.

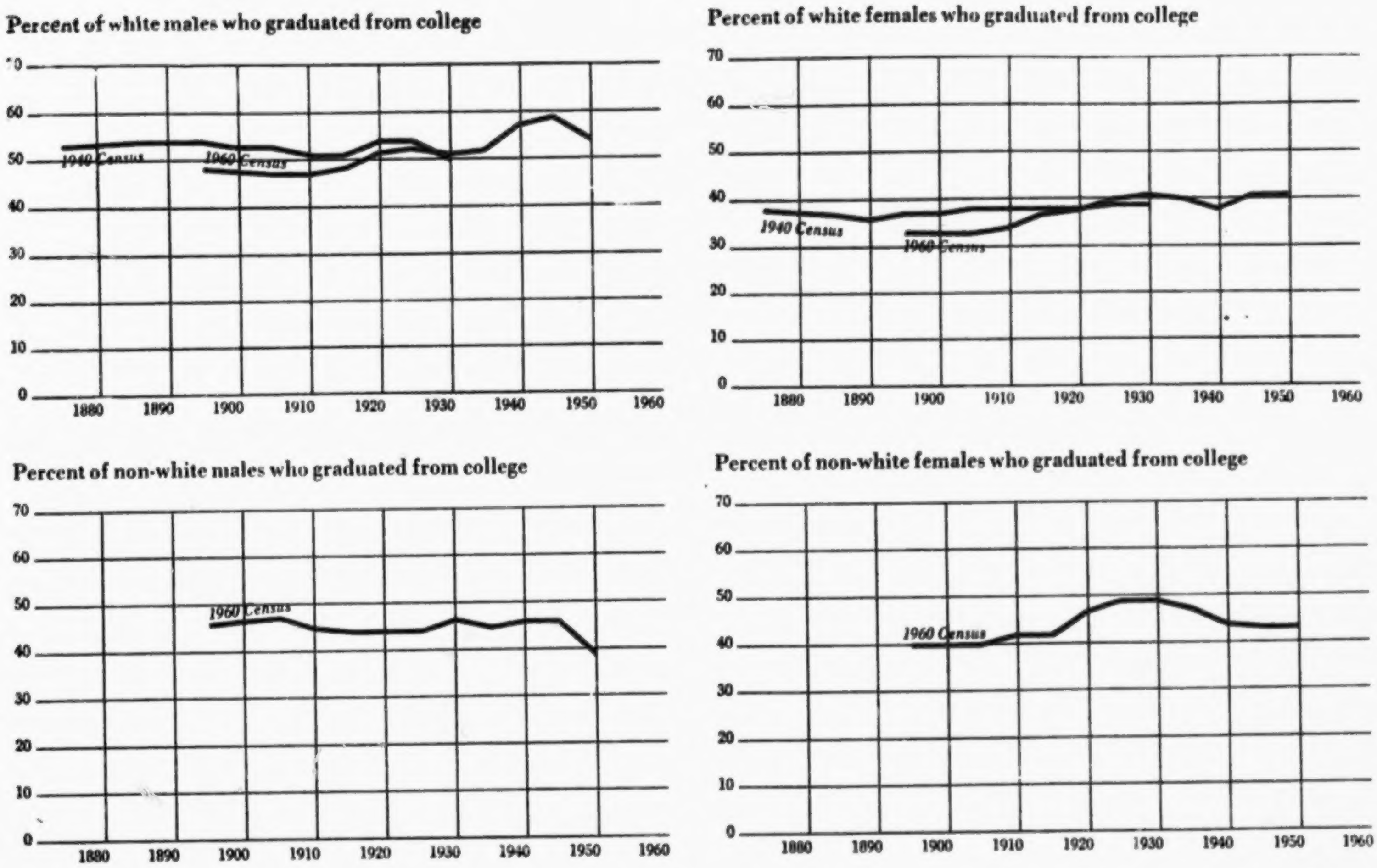
been considerable stability in college attendance for high school graduates, ever since the earliest period in U.S. history for which statistics are available.

When 1970 decennial census data become available, it will be possible to extend the historical age-cohort analysis presented in Figures 2–1, 2–2, and 2–3 to include an additional decade. But in the meantime we may note that between 1960 and 1966 according to two Census Bureau studies, the proportion of all high school graduates entering college *immediately* rose from just over four in ten to very nearly five in ten. Since at both dates (again the data are those of the Census Bureau) over a third of first-year college students had delayed college entrance for more than a year following high school graduation, we may infer that six out of ten 1966 high school graduates or more will eventually enter college. In addition to increased Federal student aid, massive expansion of inexpensive open-door public two-year community colleges probably account for the increase in college entrance in the 1960's. In 1960, 22 percent of the college freshmen selected two-year schools. In 1966 the proportion was 34 percent, or over half again the 1960 figure.

College Aspirations of Parents of High School Seniors in the 1960's

Just as high school graduation was considered a normal requirement for the upwardly mobile in past decades, so does a college degree appear to be an increasingly popular avenue for today's transition to the adult world. As high school graduation became more universal, in a short 30 years the proportion of young people in post-secondary institutions increased from one in six to more than four in ten. Walter Adams, one of the investigators on whose work this section is based, has called the college experience the "educational rite of passage which really matters."

This trend is reflected by the majority of mothers whose children were high school seniors in the Fall of 1965. Fully eight out of ten of the mothers interviewed by the U.S. Bureau of the Census in a nationwide sample used for the Current Population Survey wanted their children to attend college. Gen-


Percent of white males who graduated from college

Percent of white females who graduated from college

Percent of non-white males who graduated from college

Percent of non-white females who graduated from college

Figure 2–3.—*Percent of Males and Females who Entered Post-Secondary Education and Graduated from College, 1880–1950*

Source: A. J. Jaffe and Walter Adams, "Trends in College Enrollment," *College Board Review*, No. 55, Winter 1964–65, P. 30.

erally, more mothers of boys than of girls wanted college experience for their children. Although an identical proportion of mothers of both boys and girls had themselves attended college, about 9 percent fewer of the girls' mothers favored college for their children.

Six percent more of the mothers of non-white seniors, as compared to mothers of white seniors, wanted their children to go to college. This occurred despite the fact that only one non-white mother in ten, as compared to one white mother in six, had attended college herself.

In most cases, a mother's educational aspirations for her children are related to her own level of schooling. Seventy-three percent of the mothers of male high school seniors who had less than eight years of education themselves wished that their sons would attend college, as compared to 98 percent of mothers who had attended college.

There is an even more striking disparity between the attitudes of mothers who have different levels of education with respect to the education of their daughters. Among mothers who had had a primary education or less, 13 percent fewer desired that their daughters go to college than their sons. The difference between the aspirations for sons and daughters declined to 4 percent for mothers who were high school graduates, and was less than 1 percent for mothers who had attended college (see Table 2–1).

The length of attendance desired also correlates with the education of the mother. While a full third of the mothers with less than a high school education would be content if their children had

Table 2–1.—*Proportion of Mothers of High School Class of 1966 Who Expressed a Desire that Their Children Enroll in College, by Educational Level of Mother.*

Sex of seniors	Mothers' educational attainment			
	0–8 years	9–11 years	12 years	1 year plus college
Male	73	84	91	98
Female	60	72	87	97
Difference	13	12	4	1

Source: Unpublished tabulation by A. J. Jaffe and Walter Adams of a special survey conducted by the U.S. Bureau of the Census.

some college, at the other extreme 90 percent of the mothers who attended college desired that their children complete at least four years of postsecondary education.

The contrast is even more striking with respect to the graduate or professional school aspirations of mothers for their children in relation to their own educational experience. While one mother in six who had not attended college expressed a wish that her child should continue beyond the four years of college, one out of three mothers with some college experience expressed this aspiration for her child (see Table 2-2).

TABLE 2-2.—*Level of College Attainment Desired by Mothers for the High School Class of 1966, by Level of Education of Mother*

Level of College wished by mother	Mothers' educational attainment: 0–8 years	9–11 years	12 years	1 year plus college
	Percent	Percent	Percent	Percent
Some college	32	36	26	10
Full college	53	48	57	55
Grad. or prof. school	15	16	17	35
All levels	100	100	100	100

Source: See Table 2-1.

Some notable differences were also recorded between mothers of white and non-white seniors with respect to the level of educational attainment. Roughly half of the non-white mothers hoped that their children would graduate from a four-year college (as contrasted to 44 percent of the white mothers) and, in addition, 28 percent hoped their children would attend professional or graduate school (only 17 percent of the white mothers desired this level of attainment for their children). See Table 2-3.

TABLE 2-3.—*White, Non-White Differentials in Level of College Attainment Desired by Mothers of the High School Class of 1966, by Level of Education of Mother*

	No post-high school	Some college, but less than 4 years	Finish four-year college	Professional or graduate school	Total
White	18	21	44	17	100
Non-white	12	21	49	18	100

Source: See Table 2-1.

It is interesting to note that, in detailing college plans, twice as many non-whites as whites were planning to attend two-year colleges on their way to a four-year college degree.

College Plans of Seniors

In general, the college plans of high school seniors corresponded closely to the educational aspirations expressed by their mothers, though the aspirations of the seniors are somewhat below those expressed by their mothers. About seven out of ten seniors expressed a desire to attend college, as contrasted to eight out of ten mothers who wished their children to go to college.

The higher the education of the mother, the higher her aspirations, the more definite the college aspirations of seniors, and the closer the relation between the wishes of the mother and the aspirations of the seniors (see Table 2-4).

TABLE 2-4.—*High School Seniors' Plans and Mothers' Plans, Total, and by Educational Level of the Mother, 1960*

High School Seniors' Plans

Mothers' wishes for seniors	No college	College	Total
No college	84	16	100
College	18	82	100

High School Seniors' Plans

Mothers' wishes for seniors	Mothers' own educational attainment	No college: Number	No college: Percent	College: Number	College: Percent	Total: Number	Total: Percent
No college	No college	265	83	53	17	318	100
No college	College	9	..	.....	..	9	...
College	No college	336	21	1,230	79	1,566	100
College	College	18	5	370	95	388	100

Source: See Table 2-1.

Roughly the same proportion of white and non-white seniors were certain about their plans to attend college. By contrast, 30 percent of the non-white, as contrasted to the 24 percent white were less certain of their plans. If the differential between white and non-white attendance rates continues, one may infer that the non-white's plans are less realistic (see Table 2–5).

Comparison of Expectations of High School Seniors, 1959 and 1965.—Comparisons of the plans of seniors for two time periods, 1959 and 1965, highlight important changes in expectations. The comparison is based upon two similar (but not identical) surveys of the U.S. Bureau of the Census, which collected the information presented below as part of its October Current Population Surveys.

The questions asked by the Census make it possible to sort the college plans of seniors by family income, and also by occupation of the head of the household.[1]

When one looks at college attendance of high school seniors, keeping the dollar amount of the family income constant, the changes in college plans are quite drastic. Twenty-three percent more seniors from families with less than $3,000 in income planned to definitely attend college in 1965, as compared to 1959—double the proportion in 1959. By contrast, only 3 percent more students definitely planned to go from families in the upper half of the income distribution (see Table 2–6).

An even more dramatic change is observed if one takes into account the relative distribution of incomes. It was noted in Table 6 that the proportion of high school seniors in families with less than $3,000 income declined from 19 to 13 percent of the total. By contrast the relative proportion of seniors in families with more than $7,500 income increased from 29 to 44 percent. If the 1959 income categories are reconstituted to approximate the 1965 income distribution, an even clearer picture emerges. Once again, children of the poorest parents double their intention to enroll in college, an increase of 23 percent over 1959 levels, while those in the upper half of the income distribution increase them by 6 percent over the 1959 levels (see Table 2–7).

TABLE 2–5.—*College Plans of High School Seniors, Male and Female, White and Non-White, by Certainty of Plans, and Extent of College Planned For*

Seniors' plans	Male	Female	White	Non-white
	Percent	Percent	Percent	Percent
No college	21	37	30	20
Don't know about college	11	10	10	13
College–"Yes, maybe"	28	22	24	30
2-year college only	9	8	9	8
4-year college	19	14	15	21
College–"Yes, definitely"	40	31	36	37
2-year college only	5	5	5	7
4-year college	35	26	31	30
All plans	100	100	100	100

Source: See Table 2–1.

An equally encouraging change in high school seniors' college plans can be deduced from an analysis of their plans, when examined by occupation of head of household. The increase in college attendance intentions has been most dramatic among children of blue-collar and farm workers, and (see Table 2–8) those who are unemployed or not in the labor force.

This relationship may be of particular significance, especially when it is compared to earlier analysis which showed that very little change in the trend to go to college occurred between 1939 and 1959.[2] Analysis of college plans suggested that between 1939 and 1959 there were slight increases for children of families in all occupational groups. Only during the period between 1959 and 1965 did the expectations of children of blue-collar workers and farm workers increase drastically in comparison to the children of white-collar workers.

Though the discrepancy in college planning by income and occupation was far slighter in 1965 than in 1959, considerable differences still remained in the mid-1960's. It is our feeling, however, that with increased availability of student aid, and with increased access to inexpensive public colleges (especially two-year ones), the "planning gap" probably represents differing intellectual orientations for differing social classes as much as it represents the direct effects of greater or lesser wealth.

The reasons given by the high school seniors in 1965 for not planning on college generally support this inference. Only about one student in eight mentioned finances as the chief deterrent to college

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[1] The data presented below should be treated with caution. The questions asked in the 1965 survey, as compared to those in the 1959 survey, may favor an increase in affirmative answers. While conclusions about the overall change in levels of high school seniors are by no means firm, more confidence can be placed upon relative changes in college-going plans by income and by occupation of the head of household.

[2] Jaffe, A. J., and Adams, Walter, "College Education of U.S. Youth: The Attitudes of Parents and Children." *The American Journal of Economics and Sociology*, Volume 23, No. 1, January 1964, Table 4, p. 282.

TABLE 2–6.—*Seniors' College Plans by Family Income, Fall 1959 and 1965*

(In percent)

Family income	All high school seniors			Seniors' College Plans			
	1959	1965	% change	Total	Yes	No	Undecided
Under $3,000:	19	13	− 6				
1959				100	23	52	25
1965				100	46	39	15
% change					+23	−13	−10
$3,000–4,999:	24	17	− 7				
1959				100	40	40	20
1965				100	47	38	15
% change					+ 7	− 2	− 5
$5,000–7,499:	28	26	− 2				
1959				100	52	29	19
1965				100	58	31	11
% change					+ 6	+ 2	− 8
$7,500 and over:	29	44	+15				
1959				100	68	17	15
1965				100	71	22	7
% change					+ 3	+ 5	− 8
Total:	100	100					
1959				100	49	32	19
1965				100	60	29	11
% change					+11	− 3	− 8

Source: See Table 2-1.

TABLE 2–7.—*Comparison of High School Seniors' College Plans, Fall 1959 and 1965, Adjusted for Family Income Changes, 1959–1965, in Income Distributions*

(Percent)

Adjusted family income			Percent "Yes" for college plans
1959	1965		
Under $3,000	Under $4,000		
		1959	23
		1965	46
% change			+23
$3,000–4,999	$4,000–5,999		
		1959	40
		1965	52
% change			+12
$5,000–7,499	$6,000–8,499		
		1959	52
		1965	65
% change			+13
$7,500 and over	$8,500 and over		
		1959	68
		1965	74
% change			+ 6

Source- See Table 2–1.

attendance (or one in ten, if we include the ambiguous category "other" in the tabulations). The rest of them mentioned reasons such as marriage, apprenticeship, etc., for not continuing their education. It remains true, however, that financial deterrents were mentioned more often by students from poor families, one case out of five (excluding "other" reasons), as contrasted to one case out of ten for children whose family income exceeded $5,000 (see Table 2–9).

Some Implications of Rising Expectations

College, undoubtedly, has become an American staple. In order to accommodate the varying academic abilities of high school graduates, a variety of colleges have been established.

For minority groups and for the poorer segments of the population the "open door" community college is an important port-of-entry for post-secondary education.

The near universality of aspirations to attend college should not obscure the fact that important differences exist between whites and non-whites concerning the uses of college. Non-whites, more than whites, tend to regard college as the principal avenue towards upward mobility. Non-white females, as compared to white ones, place an especially high valuation on college as an avenue towards social mobility (see Table 2–10).

Members of minority groups pose a real challenge to the conventional concept of post-secondary education. Intentions of twelfth grade students elicited by the Equal Opportunity Report indicate that roughly two-thirds of minority (Negro, Indian, Puerto Rican, and Mexican-American) students

Table 2–8.—*High School Seniors' College Plans, Fall 1959 and 1965, by Occupation of Head of Household*

(Percent)

Major occupation group of household head	All high school seniors			Seniors' College Plans			
	1959	1965	% change	Total	Yes	No	Undecided or not reported
White-collar	34	37	+3				
1959				100	66	19	15
1965				100	74	18	8
% change					+ 8	− 1	− 7
Manual and service	48	48	...				
1959				100	37	41	22
1965				100	52	36	12
% change					+15	− 5	−10
Farm	9	6	−3				
1959				100	43	37	20
1965				100	54	28	18
% change					+11	− 9	− 2
Unemployed or not in labor force	9	9	...				
1959				100	43	37	20
1965				100	54	28	18
% change					+11	− 9	− 2
Total	100	100					
1959				100	47	33	20
1965				100	60	29	11
% change					+13	− 4	− 9

Source: See Table 2-1.

with very low verbal ability test scores planned to enroll in college. This ratio was half again as high as for majority (white plus Oriental-American [3]) students with similar achievements.[4] In the low-to-average verbal score range, one-third more minority students expressed a desire to attend a post-secondary institution than was the case for majority students. Only in the instance of high ability students were the intentions of majority and minority seniors identical (see Table 2–11).

Minority students as a group aspired to more years of education than did majority students. Generally, the lower the ability, the lower the aspirations for both groups in terms of number of years of post-secondary education to be obtained. More than half of the very low achievers expect to quit before obtaining four years of college, in contrast to one in six in high ability groups. More than 25 percent of the seniors in the high ability group desire a professional or graduate degree, as compared to 14 percent of very low achievers.

The proportion of students who plan to enroll in college from both racial groups is roughly similar, slightly favoring the minority students, despite the fact that their academic achievement is much lower. If special analyses of the Equal Opportunity Survey are to be credited, much of this higher motivation may be due to the relatively high self-regard of low achieving (by national standards) minority students, who actually believe they perform fairly well (and in many instances probably do) by the standards of their school. Mediocre

Table 2–9.—*Main Reason for Not Attending College*

	All Seniors		Family Income	
	Number (000)	Percent	Under $5,000 Percent	$5,000 & Over Percent
Learning a trade	174	27	21	32
Taking a job	155	24	30	21
No desire	111	18	14	20
Finances	77	12	18	10
Marriage	65	10	10	10
Scholarship	54	9	7	7
Total	636	100	100	100

Note: There were two additional reasons on the questionnaire checklist. No students at all checked "no college near here." Only five students checked "work to help family," and these responses are included in the "finances" category. The table also excludes "other" reasons, since we are principally concerned with the relative significance of specific and defined deterrents to college entrance. If "other" is included in the table, proportions checking each specific reason are slightly lower. "Finances," for example, becomes only 10 percent for "all seniors," "scholarship" becomes 7 percent, "taking a job" becomes 20 percent, etc.

Source: See Table 2–1.

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[3] Oriental Americans closely resemble white Americans for significant educational variables, such as test performance and educational attainment.

[4] It is possible that better-off majority students are likely to enroll in commercial trade schools, and pay for skill training which minority students expect to get in a junior college without cost.

TABLE 2–10.—*Why Seniors Planned College, 1966*

Best way to get ahead in life	Proportions of Various Groups of Seniors Planning on College
	Percent
Get a college education:	
Non-white	82
Boys	83
Girls	81
White	77
Boys	87
Girls	65
All other ways:	
Non-white	67
Boys	66
Girls	67
White	56
Boys	63
Girls	46

Source: See Table 2–1.

performance in high performance schools apparently is a deterrent to college planning for both majority and minority students—but it is also true that most students in high performance schools are majority ones.

To conclude, aspirations for post-secondary education appear to have permeated both the poor and the rich, the high and the low academic achievers, and racial majority and minority groups. This escalation in higher educational aspirations was concurrent with large increases in student aid from Federal sources during the early and mid-1960's, as well as the establishment of numerous inexpensive public colleges.

Characteristics of College Students

New Entrants.—About 25 percent of all Spring 1966 high school graduates whose family income placed them in the lower income quartile were enrolled in college by February 1967. This was roughly half of the total who expressed an interest in attending college. Four out of ten had gone to two-year colleges with the rest going to senior ones.

In the second quartile of the income distribution, roughly 40 percent (or eight out of ten of those expressing an intention to attend) had enrolled in college, with a little less than half of these attending junior colleges.

TABLE 2–11.—*College Plans and Extent of Higher Education Desired by Level of Verbal Ability, for Fall 1965 High School Seniors, Total United States*

Level of verbal ability and race	All seniors				All college planners				
	No college plans	Plans on going to college	All plans	All plans	Does not desire full college	Desires full college only	Desires grad. or prof. school	All levels of higher education desired	All levels desired
	Percent	Percent	Percent	Number	Percent	Percent	Percent	Percent	Number
Very low									
Majority	61	39	100	8,154	60	29	11	100	3,148
Minority	37	63	100	5,694	51	33	16	100	3,587
Total	51	49	100	13,848	55	31	14	100	6,735
Low to average									
Majority	43	57	100	40,294	41	43	16	100	22,969
Minority	28	72	100	4,650	35	38	27	100	3,371
Total	41	59	100	44,944	40	43	17	100	26,340
Above average									
Majority	18	82	100	40,187	15	48	37	100	33,002
Minority	17	83	100	1,157	14	40	46	100	953
Total	18	82	100	41,344	15	48	37	100	33,955
All levels									
Majority (observed)	33	67	100	88,635	28	45	27	100	59,119
Minority (observed)	31	69	100	11,501	40	36	24	100	7,911
Minority (expected)*	49*	51	100	11,501	47	37	16	100	7,911
Total (observed)	33	67	100	100,136	29	44	27	100	67,030

* The "expected" presents the minority's plans and desires as if they accorded with those of the majority with respect to levels of verbal ability.

Source: Special tabulations of the Coleman study 12th grade data, reported by Walter Adams, "Caste and Class, Relative Deprivation, and Higher Education," unpublished.

TABLE 2–12.—*High School Graduate Enrollments in College*

Family income	2-year college		4-year college		All college		No college		All high school graduates	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Under $4,000	41,979	9.7	64,873	14.9	106,852	24.6	327,840	75.4	434,692	100.0
Under $3,000	18,082	6.7	34,846	13.0	52,728	19.8	215,041	80.2	267,969	100.0
$3,000–3,999	23,897	14.3	30,027	18.0	53,924	32.3	112,799	67.7	166,723	100.0
$4,000–5,999	84,347	17.3	95,452	19.6	179,799	36.9	307.979	63.1	487,778	100.0
$6,000–7,499	42,145	11.5	108,453	29.6	150,578	41.1	215,981	58.9	366,579	100.0
$7,500–9,999	96,417	19.7	153,526	31.3	249,943	51.0	240,121	49.0	470,064	100.0
$10,000 and over	119,620	18.8	311,757	48.9	431,377	67.7	205,413	32.3	437,020	100.0
$10,000–14,999	87,145	18.3	205,018	43.0	292,163	61.3	184,369	38.7	476,532	100.0
$15,000 and over	32,475	20.2	106,739	66.5	139,214	86.7	21,274	13.3	160,488	100.0
All income levels	384,508	15.9	734,061	30.4	1,118,567	46.3	1,297,564	53.7	2,416,133	100.0

Source: See Table 2-1.

TABLE 2–13.—*1966 High School Graduates Entering and Not Entering College the Following Fall or Early Winter—and for Those Who Entered, the Type of College Entered*

Student characteristics		Entered College			
	Did not enter college	Entered a 2-year college	Entered a 4-year college	All entrants	All high school graduates
	Percent	Percent	Percent	Percent	Percent
Age, October, 1966:					
18 years or less	75	86	95	92	83
19 years or more	25	14	5	8	17
All ages	100	100	100	100	100
Family income:					
Under $3,000	16	5	5	5	11
$3,000–3,999	9	6	4	5	7
$4,000–5,999	24	22	13	16	20
$6,000–7,499	17	11	15	14	15
$7,500–9,999	18	25	21	22	20
$10,000–14,999	14	23	28	26	20
$15,000 and over	2	8	14	12	7
All incomes	100	100	100	100	100
Under $7,500	66	44	37	39	53
$7,500 and over	34	56	63	61	47
All incomes	100	100	100	100	100
Occupation, head of household:					
Blue-collar	75	56	44	48	62
White-collar	25	44	56	52	38
All occupations	100	100	100	100	100
Father's education:					
11 grades or less	60	44	23	30	45
12 grades	27	27	37	34	30
13–15 grades	9	21	14	16	13
16 grades or more	4	8	26	20	12
All levels	100	100	100	100	100
11 grades or less	60	44	23	30	45
12 grades or more	40	56	77	70	55
All levels	100	100	100	100	100

In the third income quartile, half went to college (again roughly eight out of ten of those with college-going intentions) and only four out of ten entered junior colleges.

In the top income quartile, roughly two-thirds of the total (or nine out of ten who had plans to attend) entered college, and only one out of four chose the junior college route.

According to the Census statistics, just over one-third of all the freshmen enrolling for the first time attended junior colleges. This figure differs slightly from the OE estimate which represents all first time registrations, including students who delayed entrance following high school graduation (see Table 2–12).

To bring the picture into better focus, roughly one-half of the male students and one-third of the female students from families with incomes under $6,000 a year started a college career in two-year colleges. One-third of the freshmen who came from families with an income of $6,000 to $10,000 a year chose the junior college route. Only one-fourth of the freshmen from families with incomes of $10,000 and over started out in junior colleges (see Table 2–13).

Another way of looking at the choice of colleges is by level of tuition. A freshman coming from a family with an income under $10,000 a year in one out of two instances went to an institution where the tuition fees were less than $250 per year. By contrast, children of parents with incomes over $10,000 a year usually attend high priced institutions, with less than one out of three enrolling in schools where tuition was less than $250 a year (see Table 2–14). Most colleges with tuitions under $500 are public ones, and colleges with tuitions of $500 or more are nearly all private schools (virtually all with tuitions of $1,000 or more are private although this is changing as tuitions continue to increase in both public and private colleges).

Private schools with tuitions of $1,000 and over predominantly enroll freshmen from well-to-do families. Only 6 to 10 percent of freshmen from families with less than $10,000 income a year entered these schools. By contrast, between 20 to 25 percent of freshmen from families with incomes over $10,000 a year were enrolled in high tuition (almost entirely private) colleges.

Financing of student expenses by males and females is quite different. Females receive their principal support from their families. In the lower income group, in families with incomes under $5,000, just over one-third of the males and just under half of the females had more than 75 percent or more of their expenses paid by their families. In the highest income group for which we have information, freshmen from families of $15,000 and over, 70 percent of the males and 80 percent of the females had 75 percent or more of their expenses paid by their parents (see Table 2–15).

Students in all income groups financed part of their college expenses from other sources. Roughly one-third of the students from families with incomes under $5,000 borrowed some money to pay for their college expenses. By contrast, only 16 percent of the students from families with $15,000 income or more borrowed. It would appear that summer earnings and income from work during the school year are still an important source of financing college. About one out of every two tapped the

Table 2–13. continued.—*1966 High School Graduates Entering and Not Entering College the Following Fall or Early Winter and for Those Who Entered, the Type of College Entered*

Student characteristics		Entered College			
	Did not enter college	Entered a 2-year college	Entered a 4-year college	All entrants	All high school graduates
	Percent	Percent	Percent	Percent	Percent
Father's education:					
11 grades or less	...	50	50	100	...
12 grades	...	27	73	100	...
13–15 grades	...	43	57	100	...
16 grades or more	...	14	86	100	...
Ability score:					
High	19	29	62	51	35
Medium and low	81	71	38	49	65
All levels	100	100	100	100	100
Average high school mark:					
B− or better	45	39	73	61	53
C+ or poorer	55	61	27	39	47
All marks	100	100	100	100	100
High school curriculm:					
College preparatory	19	56	84	74	45
All other	81	44	16	26	55
All curricula	100	100	100	100	100

Source: Unpublished data from 1966 Census Bureau followup of 1965 high school seniors, cited in Adams, *loc. cit.*

TABLE 2–14.—*College Tuition and Fees Paid by High School Graduates of the Class of 1966 Entering College, by Level of Income*

Subject	Total	Family Income of Student Under $5,000	$5,000–9,999	$10,000–14,999	$15,000 and over
Tuition and fees of college student is attending					
Males					
Total......	100.0	100.0	100.0	100.0	100.0
Under $250.......	42.7	49.0	50.4	32.9	32.7
$250–499.........	31.9	34.0	28.7	35.5	32.7
$500–999.........	11.7	10.6	13.2	11.8	9.1
$1,000 and over...	13.7	6.4	7.7	19.8	25.5
Females					
Total......	100.0	100.0	100.0	100.0	100.0
Under $250......	38.6	51.4	45.7	29.3	22.7
$250–499.........	34.8	34.3	32.8	41.4	31.8
$500–999.........	12.3	8.6	10.3	12.1	20.5
$1,000 and over...	14.3	5.7	11.2	17.2	25.0

Source: See Table 2-1.

first of these sources of funds, and nearly one in five the second.

Non-college employment during the academic year is an important ancillary source of income for students coming from families with less than $15,000 a year. Roughly one out of eight of these students held such a job. Scholarships also are more heavily concentrated among the poor than the rich. More than one out of four newly enrolled students from families with less than $5,000 a year, or between $5,000 and $9,999, had a scholarship or else was employed by the school, as contrasted with one out of five from families with incomes from $10,000 to $14,999, and about one out of seven from families with incomes of $15,000 and over (see Table 2–16A).

Financing at more or less expensive colleges differed considerably. Though the more affluent students at expensive colleges tend to pay a larger proportion of their costs from family funds, nevertheless the difference between the total bill and the portion of it met by parents is relatively great between children with parents with similar incomes attending schools with different costs. Consequently, students at more expensive colleges spend funds obtained from more sources, are half again as likely to receive scholarships, and two and a half times as likely to take out student loans—in comparison with students at less costly, predominantly public, colleges (see Table 2–16B).

Junior Colleges.—Junior colleges tend to attract lower income students as compared to four-year institutions. Yet, if the enrollment patterns of the mid-1960's are to be credited, they do not enroll proportionally very many more students from the lowest income quartile. Students with parental income of less than $4,000, those coming from the bottom quartile of the income distribution, accounted for 11 percent of the entrants in junior colleges, as contrasted to 9 percent in four-year institutions. (Percentages in this and the following paragraph are from Table 2–13)

The striking income contrast between two-year and four-year colleges shows up in the enrollment of children from families in the quartile right

TABLE 2–15.—*Extent of Support by Families for 1966 College Seniors, by Income*

Subject	Total	Family income of student Under $5,000	$5,000-9,999	$15,000-14,999	$15,000 and over
Proportion of college expenses paid by student's family					
Males					
Number reporting..............................	306	45	130	76	55
Total................................	100.0	100.0	100.0	100.0	100.0
More than 75 percent...........................	50.3	37.8	46.9	50.0	69.1
50 percent to 75 percent.........................	14.7	4.4	14.6	19.7	16.4
Under 50 percent..............................	15.7	20.0	18.5	15.8	5.4
None...	19.3	37.8	20.0	14.5	9.1
Females					
Number reporting..............................	251	35	115	58	43
Total................................	100.0	100.0	100.0	100.0	100.0
More than 75 percent...........................	57.4	45.7	46.1	70.7	79.1
50 percent to 75 percent.........................	12.0	14.3	18.3	10.3	7.0
Under 50 percent..............................	14.7	20.0	15.7	12.1	11.6
None...	13.9	20.0	20.0	6.9	2.3

Source: See Table 2-1.

TABLE 2–16A.—*Source of Funds (Excluding Family Support and Loans) Used to Finance College, for Freshman, Fall 1966 and Early 1967, by Level of Family Income*

Subject	Total	Family income of student			
		Under $5,000	$5,000–9,999	$10,000–14,999	$15,000 and over
Sources of funds for students' college expenses					
Total (percent)	138.2	136.6	146.5	137.0	120.1
Summer earnings	48.8	37.8	55.1	47.4	44.4
Other savings	18.5	17.1	18.2	23.7	13.1
Scholarship	18.3	23.2	20.2	15.6	13.1
Veteran's benefits	0.9	1.2	0.8	....	2.0
College employment	6.2	4.9	9.3	4.4	2.0
Non–college employment	11.9	13.4	11.3	17.0	5.1
Other sources	7.1	14.9	9.3	2.2	2.0
None of the above mentioned	26.5	24.4	22.3	26.7	38.4

Note: Sources add to more than 100 percent because of multiple mentions.

TABLE 2–16B.—*Scholarships Received and Loans Taken Out by Freshmen, Fall 1966 and Early 1967, by Level of College Tuition and Fees (excluding students mentioning no supplementary sources of funds)*

Sources of financing	College tuition and fees		
	Total	Under $500	$500 and over
	Percent	Percent	Percent
Loan	23	16	39
Scholarship	25	22	35
Average number of sources reported (including those in Table 2-16A)	1.75	1.65	2.03

Source: See Table 2–1.

above the lowest quartile, those with parents earning between $4,000 and $6,000. Just over one out of five junior college entrants are in this quartile, as contrasted to about one in eight four-year college entrants. The differences are equally pronounced among children of the rich, those with incomes over $15,000 a year: one out of 12 junior college entrants is in this income group, as contrasted to one out of seven of all four-year college entrants.

Junior colleges can be characterized, relative to four-year colleges, as institutions which cater to financially and academically poorer students, students who generally start their higher education later, and students whose parents in 11 cases out of 12 did not graduate from college.

Characteristics of Undergraduate Students Enrolled in Four-Year Institutions in 1967.—According to Census estimates, 13.1 percent of all undergraduate students attending four-year institutions came from families who had incomes of less than $5,000 a year; 19.6 percent came from families in the next income bracket, $5,000 to $7,499; 19.0 percent came from families with incomes between $7,500 and $9,000; and 48.3 percent were children from families whose income was over $10,000 a year. This does not include 18 percent of the students who claimed not to be dependent on their families. Two-thirds of these were married and living with their spouses.

Generally, the higher the family income, the higher the proportion of students in institutions with high tuition and fees. It is significant to note that students who claimed to be non-dependent on their family's support, and were married, and for whom family income information is not available, attended low tuition institutions at approximately the same rate as the dependent students in the lower income quartile. Attendance patterns of unmarried non-dependent students resembled more closely the distribution for dependent children whose parents earned $5,000 to $7,500 a year.

Non-white students accounted for less than 6 percent of the total enrollments in post-secondary institutions. More than 43 percent of them attended institutions with tuition of less than $250 a year as contrasted to 30 percent of the whites. Institutions with tuition and fees over $1,000 a year enrolled 11 percent of the non-whites as contrasted to 21 percent of the whites.

Roughly 70 percent of the students came from metropolitan areas. The students from non-metropolitan areas mostly attended institutions with low tuition and fees. This partially reflects the lower incomes of persons in rural areas, and probably regional differences in college costs as well. High cost private colleges and universities are predominantly located in the urban Northeast (see Table 2–17).

Children of the well-educated and those coming from families where the head of household had a high status occupation are represented in the college-going population much more heavily. For instance, children of parents in white collar occupations constituted close to 53 percent of the college students while blue-collar workers' children (including farm children) were 37 percent of all undergraduates. The total share of white-collar workers in the labor force is 48 percent and that of blue-collar workers is 47 percent. About 5 percent are farm workers.

Twelve percent of the children attending college had parents who had had more than 16 years of education. Eleven percent of the undergraduates had parents who had a four-year college education. In addition, 17 percent of the children had parents who had had some college. This contrasts with 33 percent of children with parents who had graduated from high school, and 28 percent whose parents had less than a high school education.

For the total population, 9 percent had a college education, 10 percent had some college, 33 percent were high school graduates, and 48 percent had less than a high school education in 1965.[5]

According to a recent study, the democratization of American post-secondary education is resulting in the combination of study with work force participation; 40 percent of all male students, and 32 percent of female students work at least part-time when going to school.[6]

Generally, children of lower status workers as well as those with less education attended less expensive colleges. The dichotomy is extremely pronounced between upper white-collar children and those with college educated fathers, and the rest of the children. The children of the former groups go to expensive schools (see Table 2–17).

An Analysis of Attendance Patterns by Sex.—Females are less likely to attend higher educational institutions than males. In the Census samples, the number of female undergraduates is one-third less than that of male undergraduates, though boys and girls are about equally represented in the total population. With the exception of children of parents with incomes over $10,000 a year, there is little difference between attendance patterns of all dependents. On the other hand, the number of non-dependent females in the total undergraduate population is a full one-third less, 13 percent versus 21 percent, compared to males.

TABLE 2–17.—*Attendance in Four-Year Undergraduate Institutions by Level of Tuition and Fees, by Income Level*

Subject	College tuition and fees				
	Total	Under $250	$250–499	$500–999	$1,000 and over
Student's family income (excluding "non-dependents")					
Total....	100.0	100.0	100.0	100.0	100.0
Under $5,000.....	13.1	18.1	13.3	13.4	5.9
$5,000–7,499.....	19.6	22.6	19.1	22.5	14.2
$7,500–9,999.....	19.0	19.2	23.7	15.4	14.5
$10,000–14,999...	29.5	26.3	29.2	30.3	33.5
$15,000 and over..	18.8	13.8	14.7	18.4	31.9
	Origins of undergraduates at four-year colleges				
Total....	100.0	100.0	100.0	100.0	100.0
Metropolitan.....	69.6	64.6	60.5	72.2	84.5
Non-metropolitan.	31.4	35.4	39.5	27.8	15.5
Total....	100.0	30.8	32.4	16.4	20.4
White...........	100.0	30.1	32.6	16.3	21.2
Non-White.......	100.0	43.3	28.4	17.0	11.3

Source: See Table 2–1.

Rating of Undergraduate Institutions. The rating by students of the quality of undergraduate institutions is generally proportional to the tuition they pay. For instance, 54 percent of the students rated the aptitude of freshmen in their college with a low average in those institutions which charged $250 or less in fees. By contrast, only 13 percent of those who attended institutions which charged $1,000 or more held that opinion of the institutions. This rating is not without its anamolies. Low ratings were received by institutions with fees of $500 to $999 as well. This may be due to the changed character of institutions in that group. While public institutions were predominant wherever tuition and fees was less than $500, some of the less expensive public institutions claim one-fourth of the students in that price range of $500-$1,000. Both boys and girls have practically identical perceptions of the quality of institutions within a given price range (see Table 2–18).

Additional Findings About the Behavior of College Students.—Some additional insights into the behavior of college students is available from Project Talent data. A five-year follow-up in 1965

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[5] Johnson, Denis F., and Hamel, Harvey R., "Educational Attainment of Workers in March 1965," *Monthly Labor Review*, Volume 89, No. 3, Bureau of Labor Statistics, U.S. Department of Labor, March 1966.

[6] Bogan, Forrest A., "Employment of School Age Youth," *Monthly Labor Review*, Volume 91, No. 10, Bureau of Labor Statistics, U.S. Department of Labor, October 1968.

Table 2–18.—*Ratings of Undergraduates of the Aptitude of the Freshman Class by Level of Tuition of College, 1967*

Subject	Total	College tuition and fees Under $250	$250–499	$500–999	$1,000 and over
Total....	100.0	100.0	100.0	100.0	100.0
Public...........	65.9	96.2	91.3	24.8	12.8
Private..........	34.1	3.8	6.7	75.2	87.3
Total....	100.0	30.8	32.4	16.4	20.4
Public...........	100.0	45.0	44.8	6.2	4.0
Private..........	100.0	3.4	8.3	36.0	52.3
Race of student					
Total....	100.0	100.0	100.0	100.0	100.0
White...........	94.3	92.0	95.0	94.0	96.8
Non-White	5.7	8.0	5.0	6.0	3.2
Freshmen aptitude index of college					
Total....	100.0	100.0	100.0	100.0	100.0
Below average....	40.0	57.8	32.1	46.7	15.9
Above average....	60.0	42.2	67.9	43.3	84.1
Total....	100.0	29.8	33.1	15.3	21.9
Below average....	100.0	43.1	26.5	21.7	8.7
Above average....	100.0	20.9	37.4	11.1	30.6

Source: See Table 2–1.

of twelfth grade students in 1960 corroborates to a large extent with the data which were collected by the Census. It also provides a further insight into understanding the behavior of college students by socioeconomic class, which can be roughly equated to income.

The data from Project Talent illustrate the effect of high school preparation on differential attendance rates. For instance, 40 percent of the children of the low socioeconomic quartile find themselves in the bottom of the achievement group. By contrast, 44 percent of the children in the upper socioeconomic quartile are high achievers in high school (see Table 2–19).

Enrollment rates in 1960 were proportional to both achievement and socioeconomic status. For the class of 1960 it would appear that 96 percent of the children in a high ability quartile will attend some post-secondary institution during their youth. Enrollment rates are lower in the middle and lower socioeconomic groups (see Table 2–20).

Richer children tend to enroll in school earlier and to graduate earlier. This is illustrated in Table 2–21, which calculates the ratio of first year enrollments to those who were enrolled in a higher education institution at any time during the six-year period. It can be seen from this table that the children with parents in the upper half of the income distribution, are likely to enroll early, and close to 80 percent of all attendees enroll in the first year of eligibility, as contrasted to 64 percent of children of poor parents.

Table 2–19.—*High School Graduates by Income Quartile and Achievement (Quartiles, Ratios to Total), 1960 Cohort*

Income quartile	Achievement High	3rd	2nd	Low	Total
		Males			
High......	.117	.083	.050	.013	.263
3rd........	.084	.072	.059	.043	.258
2nd.......	.051	.060	.068	.071	.250
Low.......	.019	.047	.072	.091	.229
Total....	.271	.262	.249	.218	1.000
		Females			
High......	.108	.079	.054	.019	.260
3rd........	.082	.071	.060	.043	.256
2nd.......	.056	.062	.066	.066	.250
Low.......	.030	.052	.068	.084	.234
Total....	.276	.264	.248	.212	1.000

Source: Adjusted from Project Talent, see Technical Appendix B.

Table 2–20.—*Rates Ever Enrolled at the Beginning of the Sixth Academic Year After High School Graduation (by Quartile, Ratio to Total), 1960 Cohort*

Income quartile	Achievement High	3rd	2nd	Low	Total
		Males			
High......	.96	.79	.56	.43	.80
3rd........	.80	.65	.46	.25	.59
2nd.......	.78	.60	.37	.17	.45
Low.......	.77	.44	.23	.10	.27
Total....	.86	.64	.39	.18	.54
		Females			
High......	.89	.64	.38	.19	.66
3rd........	.64	.26	.24	.25	.37
2nd.......	.52	.22	.19	.17	.27
Low.......	.26	.15	.12	.11	.14
Total....	.65	.35	.22	.16	.37

Source: See Table 2–19.

The number of semesters attained by students is directly related to the resources of the families of the students. Students from less affluent backgrounds either attend parttime, episodically, or quit sooner than more affluent students (see Table 2–22).

TABLE 2-21.—*Proportion Enrolled in First Year After Graduation to Those Ever-Enrolled in Following Six Years, 1960*

(By Socioeconomic Quartiles in Percent)

High	78
2nd	79
3rd	73
Low	64

Source: See Table 2-19.

TABLE 2-22.—*Years Attained Per Year Attended by Income and Ability Quartiles*

		Ability				
		Low	2nd	3rd	4th	Total
			Males			
Income	Low	.69	.71	.77	.89	.77
	2nd	.68	.74	.82	.90	.82
	3rd	.68	.77	.84	.92	.86
	4th	.66	.83	.89	.95	.91
			Females			
Income	Low	.73	.78	.74	.85	.78
	2nd	.74	.76	.78	.89	.82
	3rd	.71	.76	.83	.90	.84
	4th	.76	.82	.87	.95	.90

Source: See Table 2-21 and Project Talent, also Appendix C.

Summary.—The 1960's were a period of dramatic growth in aspirations of parents in modest circumstances to have their children attend college. The children, on the whole, shared the parents' aspirations. Intentions to go to college doubled in the lowest income quartile between 1960 and 1966. College aspirations were especially high for nonwhites when compared to whites with parents of similar educational attainment. Negro males and particularly Negro females regard college as an important avenue for social mobility.

The junior colleges and colleges with low tuition are the predominant choices of children whose families rank in the lower half of the income distribution. By contrast, private schools, and schools with high tuition attract the children from more affluent families.

Despite the increase in aspirations of children of the lower income groups, their college attendance rates are still 20 to 33 percent below the rate of college attendance of the children of parents in the top income quartile. Part of the difference can still be ascribed to financial barriers. An even more important block to college attendance is their relatively poor achievement in high school. If children in the lowest income quartile attended college in line with the attendance patterns of children in the top quartile, 50 percent would have aimed for college instead of 46 percent.

It would appear that despite the more generous availability of student aid, many eligible children of poor parents do not enroll in college immediately after graduation. The proportion of those who did to those who wanted to go the year after graduation remained fairly similar from 1960 to 1967. It was roughly half for the children of parents in the low-income quartile, and more than three-quarters for the children of richer parents.

3. Projections of Enrollment to 1976

This section discusses the results of a projection of the demand for post-secondary education for the period 1968-76. Two projections are presented. The first, (see Table 3-1) referred to for convenience as the OPPE model, projects attendance rates by income and achievement quartile to arrive at an estimate of 8.4 million full-time equivalent students in 1976. This figure, about .5 million students higher than the National Center for Educational Statistics (NCES) projection of past trends, could be taken to imply that not every student who wishes to enroll in post-secondary institutions is likely to be afforded this opportunity if other things remain equal.

TABLE 3-1.—*Degree Credit Full-Time Equivalent Enrollment—OPPE Model by Income Quartile*

(Thousands of students)

	Low	2nd	3rd	High	Total
1960.....	335.68	513.64	842.79	1289.77	2981.89
1961.....	379.58	563.98	916.56	1386.80	3246.93
1962.....	427.24	612.63	983.77	1472.85	3496.49
1963.....	478.24	659.65	1047.52	1552.12	3737.53
1964.....	541.69	723.16	1135.36	1660.15	4060.37
1965.....	623.37	808.09	1252.57	1805.48	4489.52
1966.....	712.07	894.38	1368.17	1950.01	4924.63
1967.....	806.44	981.98	1484.92	2101.56	5374.90
1968.....	895.90	1062.05	1587.22	2235.66	5780.82
1969.....	974.77	1131.23	1670.02	2337.54	6113.56
1970.....	1050.06	1198.66	1755.15	2436.09	6439.97
1971.....	1128.74	1273.17	1863.63	2569.72	6835.26
1972.....	1209.03	1350.70	1984.29	2725.39	7269.41
1973.....	1278.64	1417.82	2084.70	2849.02	7630.18
1974.....	1339.70	1476.91	2169.55	2947.67	7933.83
1975.....	1395.04	1530.35	2245.95	3039.32	8210.66
1976.....	1446.19	1579.32	2320.38	3131.92	8477.81
1977.....	1493.66	1624.88	2398.87	3225.50	8737.92

Source: OPPE Model.

The second projection (see Table 3-2) which is referred to as the "complete equality" projection, forecasts student enrollments from 1970 on based on the estimated attendance patterns of the upper income quartile. It arrives at an estimate of 9.2 million full-time equivalent students in 1976. This estimate can be taken as the upper limit of possible enrollments under conditions of unlimited availability of student aid, accompanied by substantial changes in propensities of children of poorer parents to enroll in college.

TABLE 3-2.—*Degree Credit Full-Time Enrollment —Complete Egality Model by Income Quartile*

(Thousands of students)

Income quartiles	Low	2nd	3rd	High	Total
1970.......	975.9	1399.9	1803.2	2207.3	6386.3
1971.......	1027.5	1475.3	1901.5	2328.5	6732.8
1972.......	1084.5	1561.0	2015.0	2469.9	7130.4
1973.......	1133.8	1631.9	2106.4	2581.8	7453.9
1974.......	1177.4	1691.4	2180.6	2670.8	7720.2
1975.......	1218.6	1747.1	2249.9	2753.5	7969.0
1976.......	1258.0	1801.9	2319.1	2837.1	8216.1
1977.......	1296.6	1856.5	2388.7	2921.7	8463.5

Source: OPPE Model.

The remainder of this section contains a nontechnical discussion of the methodology and assumptions underlying the projections. The technical discussion and mathematical representation of the models is reproduced in Appendix B.

Considerations in Projecting Demand for College Attendance.—The key factors which will affect college enrollments in the next few years are: (1) the propensity of high school graduates with different levels of academic achievement and financial resources to enroll in college, (2) the time schedule by which they enroll, i.e. immediately after high school or a number of years later, (3) the persistence rates of different types of students, and (4) the availability of student aid to make their desires come true.

The model below takes into account the first three factors, and ignores the fourth. Its purpose is to project the number of students who may wish to attend and, as is done subsequently, the demand for student aid.

This year's estimates of the proportion of freshmen enrolling in colleges are computed taking into account the dynamic change in enrollment rates in contrast to last year's projections which were static.[1]

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[1] Cf. Joseph Froomkin, *Students and Buildings, An Analysis of Selected Federal Programs for Higher Education*, U.S. Department of Health, Education, and Welfare, U.S. Office of Education, Government Printing Office, Washington, D.C., 1968, Section 3.

First-time enrollments by income class vary from year to year according to past trends in the propensities to enroll in college. Thus, the proportion of high school graduates from families in the lowest income quartile in proportion to all seniors who will enroll in college one year after high school graduation is projected to increase to 15 percent in 1976, in comparison with the rate of 10 percent observed by Project Talent for 1960, and an estimated entry rate of 12 percent in the Fall of 1968.

New estimates of attrition rates by ability and income group were also derived this year by using information which has become available from special tabulations of the five-year followup interviews of Project Talent participants. These estimates were checked, and adjusted whenever necessary, to conform with U.S. Bureau of the Census estimates of attendance by age. Together with more refined assumptions about the timing of entry and enrollment rates by income group, the new estimates of attrition rates present a much more realistic representation of the social demand for education at the post-secondary level, than the "medium" projection calculated last year.

As pointed out in the previous chapter, varying proportions of children from families with different levels of affluence enroll in the year after graduation, and also delay enrollment at different rates. Judging from the five-year follow-up data of Project Talent, as well as follow-up of high school seniors conducted by the U.S. Bureau of the Census in 1959 and 1966, the pattern of delayed enrollments has remained fairly constant over the past few years. Roughly nine out of ten children whose parents are in the top quartile of the population in terms of income are likely to enroll in college in the year following high school graduation. By contrast, only five out of ten children whose families are in the lowest income quartile are likely to enroll in the same year. These developments are included in the model.

The basic statistics of high school graduates were taken from the National Center for Educational Statistics series. The freshman class of 1976 is already born, and barring some unforeseen changes in the trend of dropouts from high school, the estimates of high school graduates by year and by sex prepared by the National Center for Educational Statistics, U.S. Office of Education, are likely to be fairly accurate.

Test of the Model in Forecasting Past Enrollments.—A test of the predictive accuracy of the estimates underlying the calculations of the model is to compare them with estimates of previous years' enrollments presented by the Office of Education. For the period 1960–68, the estimates of the model when compared with those of the NCES never deviate more than 2.5 percent. (See Table 3–3).

Given the large number of factors taken into

TABLE 3–3.—*Total Enrollment—OPPE Model, by Income Quartile and Total*

(Thousands of students)

	Low	2nd	3rd	High	Total	OE[1]	Difference	Percent
1960	419.0	624.9	1011.5	1529.7	3585.0	3583.0	2.0	0.06
1961	474.3	686.7	1100.4	1645.2	3906.6	3861.0	45.6	1.17
1962	534.4	746.4	1181.2	1747.4	4209.3	4175.0	34.3	.81
1963	599.1	804.2	1257.9	1841.3	4502.4	4495.0	7.4	.16
1964	680.3	882.8	1364.2	1970.2	4897.6	4950.0	−52.4	−1.07
1965	785.6	988.5	1506.3	2143.7	5424.1	5526.0	−101.9	−1.88
1966	900.0	1095.8	1646.3	2315.7	5957.8	5885.0	72.8	1.22
1967	1021.8	1204.8	1787.5	2495.2	6509.4	6348.0	161.4	2.48
1968	1137.7	1304.6	1911.6	2654.3	7008.4	6983.0[2]	25.4	.04
1969	1240.7	1391.4	2012.8	2775.9	7420.7	......	......	....
1970	1339.4	1476.0	2116.8	2893.7	7825.9	......	......	....
1971	1442.5	1569.4	2248.7	3052.2	8312.7	......	......	....
1972	1547.4	1666.2	2395.2	3236.4	8845.3	......	......	....
1973	1638.6	1750.3	2517.6	3383.3	9289.9	......	......	.....
1974	1718.8	1824.4	2621.2	3501.4	9665.7	......	......	....
1975	1791.5	1891.3	2714.5	3611.1	10008.6	......	......	....
1976	1858.5	1952.6	2805.4	3721.6	10338.0	......	......	....

[1] National Center for Educational Statistics, *Projections of Educational Statistics to 1977-78*, (Washington, D.C.: Government Printing Office), p. 16 (all except 1968).

[2] National Center for Educational Statistics, *Opening Fall Enrollment in Higher Education, 1968*, (Washington, D.C.: Government Printing Office), p. 6.

Source: All data except as noted in [1], OPPE model.

consideration in deriving the model, it is highly encouraging that the projections of past experience and estimates made on an imdependent basis are so close together.

Total Enrollment Projections.—The projection of total enrollment derived by this projection method appears in Table 3–3. It is estimated that total enrollment may exceed ten million students by 1976, nearly a million students above the NCES estimate of total enrollments. The difference between the two estimates is due to the difference in the methods used to derive them and, more importantly, the purpose for which the estimates are constructed. The NCES projects past trends, while the model presented here predicts future demand for higher education. A word of caution should be injected. Both the model and NCES projections may fail to forecast accurately if drastic shifts in attitudes or economic conditions occur in the next few years.

The projections of enrollment by income quartile indicate that despite the higher first time entry rates into college of lower income students, the participation of lower income students in the total population of higher education is not likely to change drastically in the next few years, with the lowest half of the distribution picking up a few percentage points in the total enrollment moving from 29 percent in 1960, and 35 percent in 1968 to 37 percent in 1976.

Full-Time Equivalent Enrollment Estimates.—Total enrollment is an approximate measure of the load placed upon institutions of higher education. The more conventional measure of the burden is the full-time equivalent enrollment for 1976, reproduced in Table 3–1, of 8.5 million students for the OPPE model. The model projects equal growth in numbers of full-time equivalent students between 1960 and 1968, and 1968 and 1976, but a decline in the rate of growth.[2] The increases of 46 percent for the period 1968 to 1976 is below the 90 percent increase between 1960 and 1968.

Estimates of Graduate and Undergraduate Enrollments.—Further estimates were made to separate total enrollment into undergraduate and graduate enrollment, and into full-time enrollment (see Table 3–4). Different rates of full-time attendance were imputed to each income/achievement quartile. These rates, derived from Project Talent one-year follow-up data were adjusted to conform with observations for the total population collected by NCES in 1964.

There is substantial difference in the proportion of full-time students by income quartile. In the lowest income quartile, it is estimated that only 64 percent of the students attend full time; 90 percent of students in the highest income quartile are estimated to attend full time.

The number of undergraduate and graduate students by income quartile was estimated on the basis of the trends (1) derived from NCES of the proportion of graduate to undergraduate students, and (2) the estimated number of graduate students. The estimate of expected graduate students by income quartile is based on aspirations for graduate degrees of the Project Talent population. These were compared with data on social origins available in a study of graduate students conducted by NCES in 1965.[3]

The resulting estimates of total graduate and undergraduate students were adjusted for differences in full-time and part-time attendance by income quartiles. It was assumed that income differentials which affected full-time attendance of undergraduates would also apply to graduate students. These factors were applied to the much lower full-time attendance patterns of graduate students.

The resulting estimates of total undergraduate and graduate enrollments, and the number of full-time undergraduate and graduate students appears in Table 3–4.

The "Complete Equality" Projection.—An alternative projection which, from 1970 on, ascribed propensities to enroll high school seniors and retention rates of college students from families in the highest income quartile is reproduced in Table 3–5. It estimates total enrollments of 11.2 million in 1976; 870,000 more than the enrollments produced by the OPPE model. If these patterns are followed, enrollment of children from the lowest half of the income distributions could constitute some 40 percent of the total enrollment.

The assumptions underlying this projection are that in 1976 52.5 percent of the graduating class

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[2] It should be noticed that the relationship between total and full-time equivalent enrollment varies from year to year in the projections, and is different from NCES estimates. Full-time equivalent enrollments have been imputed by the model on the basis of attendance rates by quartile. NCES projects a slightly changing mix between full-time and part-time students. See Technical Appendix C.

[3] National Center for Educational Statistics, *The Academic and Financial Status of Graduate Students*, (Washington, D.C., Government Printing Office), 1965.

TABLE 3-4.—*Total, undergraduate, and graduate degree credit students—by income quartile and year*

(Thousands of students)

Income quartile:	Low			2nd			3rd			4th			All students		
	Total	Undergraduate	Graduate	Total	Undergraduate	Graduate	Total	Undergraduate	Graduate	Total	Undergraduate	Graduate	Total	Undergraduate	Graduate
1960	419.0	362.5	56.4	624.9	518.6	106.3	1011.5	887.2	124.2	1530.0	1313.3	216.3	3585.0	3081.6	503.4
1961	474.3	412.2	62.1	687.0	570.0	117.1	1100.4	963.4	137.0	1645.3	1407.0	239.0	3906.6	3351.8	554.8
1962	534.4	466.8	67.6	746.3	618.7	127.6	1181.2	1032.0	149.2	1747.3	1487.3	260.0	4209.3	3604.8	604.4
1963	599.1	525.9	73.2	804.1	666.2	138.0	1257.9	1096.6	161.4	1841.3	1560.1	281.1	4502.4	3848.8	653.6
1964	680.3	599.9	80.5	882.8	730.9	151.9	1364.3	1186.6	177.7	1970.1	1660.5	309.7	4897.6	4177.8	719.7
1965	785.5	695.2	90.3	988.5	817.9	170.6	1506.4	1306.7	199.7	2143.7	1795.7	348.1	5424.1	4615.4	808.8
1966	900.0	799.3	100.6	1095.9	905.8	190.1	1646.3	1423.7	222.6	2315.7	1927.7	387.9	5957.8	5056.6	901.2
1967	1021.8	910.2	111.6	1204.8	994.1	210.7	1787.5	1540.8	246.7	2495.3	2065.3	430.0	6509.4	5510.4	999.0
1968	1137.8	1016.0	121.7	1304.6	1074.8	229.8	1911.6	1642.7	269.0	2654.3	2185.6	468.7	7008.3	5919.2	1089.2
1969	1240.7	1110.6	130.2	1391.3	1145.7	245.7	2012.8	1725.2	287.5	2775.9	2274.9	501.0	7420.7	6256.4	1164.4
1970	1339.4	1200.9	138.5	1476.1	1214.7	261.4	2116.8	1810.9	305.9	2893.7	2360.7	533.0	7825.9	6587.2	1238.7
1971	1442.5	1293.6	148.9	1569.4	1288.6	280.8	2248.7	1920.3	328.4	3052.2	2480.0	572.2	8312.8	6982.4	1330.4
1972	1547.4	1386.8	160.6	1666.3	1363.7	302.6	2395.2	2041.6	353.6	3236.4	2620.5	615.9	8845.3	7412.6	1432.7
1973	1638.6	1468.5	170.2	1750.3	1429.7	320.6	2517.5	2143.0	374.5	3383.4	2731.1	652.3	9289.8	7772.3	1517.5
1974	1718.9	1540.7	178.1	1824.4	1488.8	335.6	2621.2	2229.1	392.1	3501.4	2818.4	682.9	9665.7	8077.0	1588.7
1975	1791.5	1606.1	185.4	1891.4	1542.0	349.4	2714.6	2306.4	408.2	3611.1	2900.0	711.0	10008.5	8354.5	1654.0
1976	1858.5	1665.8	192.7	1952.6	1589.7	362.9	2805.4	2381.4	424.0	3721.6	2983.1	738.4	10338.0	8620.0	1718.0

Source: OPPE model.

TABLE 3–5.—*Degree Credit F.T.E. Enrollment—Complete Equality Model by Income Quartile*

(Thousands of students)

	Low	2nd	3rd	High	Total
1970.....	1129.04	1582.48	2009.46	2436.09	7157.06
1971.....	1188.77	1667.70	2118.87	2569.72	7545.05
1972.....	1254.61	1764.28	2244.93	2725.39	7989.21
1973.....	1311.70	1844.44	2346.83	2849.02	8351.99
1974.....	1362.35	1912.09	2430.05	2947.67	8652.17
1975.....	1410.28	1975.57	2507.67	3039.32	8932.84
1976.....	1456.04	2037.78	2585.12	3131.92	9210.86
1977.....	1500.84	2099.62	2662.85	3225.50	9488.82

Source: OPPE Model.

will enroll in college the year following graduation as compared to a little over 40 percent in 1968. The dropout rate is also reduced drastically, with the assumption made that 66 percent of the entering class will receive a B.A. within five years of high school graduation, as compared to about 50 percent, the rate observed in the late 1960's. The figures presented in Table 3–5 can thus be taken as an upper limit of possible enrollments under conditions of availability of adequate student aid and drastic shifts in attitudes towards college attendance.

The reason why children from families in the lower income quartiles are projected to attend only at .8 the rate of children of those in the upper quartile is their poorer high school records. Since propensity to persist in one's post-secondary education is directly related to high school performance, even with the removal of financial constraints, some inequalities still remain.

The effect of Financial Limitations on Attendance Patterns.—A comparison of projected total enrollment, full-time equivalent enrollment, and full-time enrollment highlights the impact of the difference in financial circumstances on attendance patterns. Table 3–6 shows that the relationship of total enrollment between the demand projection and the complete equality projection is slightly over 8 percent for 1976. Full-time equivalent enrollment increases also by 8 percent, and full-time enrollment by 9 percent.

TABLE 3–6.—*Relationship of Complete Equality to OPPE Model*

(Complete Equality as a Percent of OPPE Model)

	Total enrollment	Full-time enrollment	Full-time equivalent
	Percent	Percent	Percent
1970.....	111.15	111.11	111.13
1971.....	111.65	110.43	110.38
1972.....	109.74	110.01	109.90
1973.....	109.24	109.61	109.46
1974.....	108.80	109.22	109.04
1975.....	108.50	108.90	108.79
1976.....	108.33	108.85	108.64

Source: OPPE Model.

The removal of all financial constraints has only a moderate effect on the number of students likely to attend institutions of higher education. By contrast, the effect is somewhat pronounced for students who are likely to attend full time. In other words, if the assumptions underlying the projections are correct, the removal of financial constraints is likely to have a more pronounced effect upon the intensity of studies than they have upon the numbers attending.

Summary and Conclusions.—The projections above indicate that if the trends of the past few years have been modeled realistically, the rate of growth in enrollments is likely to taper off. Nevertheless, it is quite likely that the absolute increases in the number of students will be as large in the next eight years as they have been in the past eight.

Part II

This part summarizes the research on certain policies of postsecondary institutions. Course offerings, costs of instruction, educational costs, etc. are examined to document the great diversity of the system. An analysis of institutional characteristics in relation to admission policies and subsidies to students is also presented.

4. Diversity in the Post-Secondary System

Americans take for granted the diversity of the post-secondary system. We have learned the uses of an MIT and of a junior technical college, and have learned to tolerate the difference between Harvard and a struggling, rural developing institution. However, this diversity does complicate the analysis of inputs and outputs in higher education. The costs incurred in conferring a Bachelor's degree in one institution may be as much as four times higher than those of another institution offering a similar curriculum. An observer of the educational scene is confronted with the choice of two unpleasant conclusions: (1) all B.A.'s are not equivalent in value, or (2) the system is quite inefficient in the delivery of services. Since these hypotheses are not mutually exclusive, it is quite possible that a combination of the two does describe reality.

Without passing any Olympian judgments on the system, one may gain some insights into the possible role of Federal policy in equalizing resources by looking more closely at this diversity. This section reports on research which can contribute to these insights: (1) a study of the diversity of course offerings by type and location of institutions, (2) a study of the diversity of instructional costs by level of instruction and by institution in one State university system, (3) an analysis of instructional costs by type of institution. This last analysis is then used for (4) an estimate of the incidence of subsidies from higher education by income group.

Diversity in Offerings by Type of Institution and Location in School.—Approximately seven million degree and non-degree credit students were enrolled in institutions of higher education during the 1967-68 academic year. Our survey estimates that 1.3 million class sections per week met for a total of about 3.2 million class hours.

Course offerings by discipline. About 60 percent of all class-hours were offered in the fields of the social sciences, business, law, liberal arts, and humanities. About 17 percent were offered in the physical sciences including biological and health professions. An additional 5 percent covered engineering and the computer and systems fields. Slightly more than 10 percent were offered in fine and applied arts, including architecture (see Table 4–1).

Offerings by location and time of day. More than one-third of all class-hours were offered by institutions located within the major metropolitan areas. About 11 percent of all class-hours were held after 5:00 p.m. Approximately 18 percent of class-hours offered by institutions located in major metropolitan areas were evening classes, as compared to 10 percent of class-hours offered outside metropolitan areas. The numbers of evening class-hours offered inside and outside major metropolitan areas are about equal, however, since nearly twice as many class-hours are offered outside metropolitan areas as in the metropolitan districts.

The distribution of course offerings by discipline in central cities does not differ radically from the national average; thus, 63 percent of all courses are offered in the liberal arts, business, and social

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[1] A sample survey of class schedules was conducted by ETS for the Office of Program Planning and Evaluation. It consisted of a probability sample of 566 campuses selected from lists of all institutions of higher education, except theological institutions. Campuses were selected with probability proportionate to size of 1967 fall enrollment. All campuses with an enrollment of 10,000 or more in the Fall of 1967 were included in the sample. Campuses with less than 10,000 students were included in the sample with known probabilities which diminish as enrollment is smaller. For example, a campus with 5,000 students in the Fall of 1967 would be included in the sample with a probability of one-half. A campus with 2,500 students would be included in the sample with a probability of one-in-four.

Published class schedules for the spring term of 1968 covering both day and evening classes were obtained from more than 70 percent of the institutions selected within the time available for this particular phase of the study. Nonrespondent institutions are nevertheless represented in the statistical estimates. The weight assigned to a respondent institution of the same type and control nearest in size to a particular nonrespondent institution was adjusted to cover the omitted date.

Once class schedules were obtained, a subsample of one-in-sixty class sections from each campus was listed and coded with respect to academic level; subject field; day-of-week; hour-of-day; class-hours per week; and whether lecture, laboratory or other section. More than 8,700 class sections were included in the survey.

TABLE 4–1.—*Class Hours of Instruction Offered Per Week by Major Field and Type and Control of Institution: Spring Term 1968*

(Percent)

Major Field	Public					Private					
	Univ.	4-Year	Less than 4-Year	Tech.	Public Total	Univ.	4-Year	Less than 4-Year	Tech.	Private Total	Grand Total
Agriculture, Forestry, Home Economics	3.6	2.8	.6	.9	2.2	2.7	.3	2.3	*	1.0	1.8
Biological Science, Health Professions, Physical Science	19.9	16.1	18.5	16.3	18.3	15.3	16.0	8.1	20.9	16.1	17.6
Computer Science, Systems Engineering	7.7	3.1	3.2	3.5	5.1	5.8	2.1	*	5.3	3.5	4.6
Architecture, Fine and Applied Arts	10.8	11.6	10.6	11.1	10.9	11.5	9.2	8.1	12.7	10.3	10.7
Liberal Arts, Humanities, Business, Law, Social Science	56.0	62.3	53.5	65.0	58.0	63.0	70.5	70.6	58.3	66.5	60.6
Vocational	2.1	4.0	13.6	3.3	5.5	1.8	1.9	10.9	2.9	2.6	4.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* Less than one-half of one percent.
Components may not add to totals due to rounding.

Source: OPPE Survey of Class Schedules.

sciences, compared to 60 percent nationally. However, the evening programs are generally lighter in physical sciences; they account for less than 12 percent of the total offering. By contrast, vocational courses take up 9 percent of the offerings compared to 5 percent in the Nation (see Table 4–2).

The metropolitan area programs (outside of central cities) do not differ strikingly from the national pattern. They are somewhat heavier on science courses at night, which account for 15 percent of the offerings.

Outside metropolitan areas, where the bulk of the instruction is offered, there were no surprises in course distribution by subject matter either.

Offerings by level of instruction. Some 58 percent of all class-hours were offered at the first two years of undergraduate level. An additional 5 percent were vocational courses at all levels of complexity. Upper-division undergraduate students receive about 29 percent of all class-hours of instruction offered. Graduate and advanced professional work accounts for about 8 percent of the total (see Table 4–3). It is interesting to note that *private universities offerings of graduate courses* were twice as heavy as the national average while *public* universities were *some 50 percent above* the national average. Colleges, teachers colleges and liberal arts institutions had fewer graduate courses.

Offerings by type and control. The most striking difference between private and public universities was in the proportion of science courses in the total offerings. In private universities science courses

TABLE 4–2.—*Class Hours of Instruction Offered Per Week by Major Field and Location: Spring Term 1968*

(Thousands of class hours)

Major Field	Location						
	Center City		Metro Area Other than Center City		Outside Metro Area		
	Day	Evening	Day	Evening	Day	Evening	Total
Agriculture, Forestry, Home Economics	5	*	7	*	46	*	60
Biological Science, Health Professions, Physical Science	99	11	80	12	333	17	553
Computer Science, Systems, Engineering	23	5	38	4	81	6	156
Architecture, Fine and Applied Arts	49	10	60	6	195	24	344
Liberal Arts, Humanities, Business, Law, Social Science	331	61	278	59	1,078	115	1,922
Vocational	23	8	14	5	76	17	142
Total	530	95	478	87	1,810	179	3,178

* Less than 1,000 hours.
Components may not add to totals due to rounding.

Source: OPPE Survey of Class Schedules.

TABLE 4–3.—*Class Hours of Instruction Offered Per Week By Type and Control of Institution and Level of Course: Spring Term 1968*

(Percent)

	Public					Private					
Level of Course	Univ.	4-Year	Less than 4-Year	Tech.	Total Public	Univ.	4-Year	Less than 4-Year	Tech.	Total Private	Grand Total
Lower Division	15.2	6.4	13.6	7.4	42.6	3.5	8.3	1.5	2.5	15.8	58.4
Upper Division	9.0	4.0	1.7	3.8	18.5	2.7	6.2	*	1.8	10.7	29.2
Grad. & Prof.	3.5	.8	*	1.1	5.3	1.5	.4	*	.5	2.4	7.8
Academic Total	27.7	11.2	15.3	12.3	66.4	7.7	15.0	1.5	4.8	28.9	95.4
Vocational	.6	.5	2.4	.4	3.9	.1	.3	.2	.1	.8	4.6
Total	28.2	11.7	17.7	12.7	70.3	7.8	15.3	1.7	4.9	29.7	100.0

* Less than one-half of one percent.
Components may not add to totals due to rounding.

Source: OPPE Survey of Class Schedules.

were 21 percent of the total offerings; in public universities they accounted for 28 percent. Science offerings also took up a much smaller part of the schedule in private junior colleges, 8 percent, as contrasted to 22 percent at publicly supported schools of the same type (see Table 4–4).

Utilization of facilities. A tentative measure of the intensity of utilization of facilities came as a by-product of the analysis of class schedules. An arbitrary standard was chosen: the ratio of total hours offered per week, to 40 times the number of class-hours held during the peak period. If peak-hour scheduling utilizes the maximum capacity of institutions, or at least a constant proportion of that capacity for all institutions, then it can be claimed that public universities outside metropolitan areas, junior colleges in metropolitan areas and private universities in central cities utilized their classroom most intensively. Overall, the utilization of classrooms, using this measure, appeared to be higher in the public as compared to the private sector (see Table 4–5).

Conclusion. The course offerings by discipline and by time of day do not seem to vary very drastically by location or school.

A Case Study of the Oklahoma State System.—While course offerings by discipline do not appear to vary by institutional type, the expenditures incurred by institutions have a very wide variance. An illustration of how these outlays vary between

TABLE 4–4.—*Class Hours of Instruction Offered Per Week By Major Field and Type and Control of Institution: Spring Term 1968*

(Percent of total for each field)

	Public					Private					
Major Field	Univ.	4-Year	Less than 4-Year	Tech.	Public Total	Univ.	4-Year	Less than 4-Year	Tech.	Private Total	Grand Total
Agriculture, Forestry, Home Economics	54.5	17.8	5.6	6.2	84.1	11.4	2.3	2.2	*	15.9	100.0
Biological Science, Health Professions, Physical Science	31.9	10.7	18.6	11.6	72.8	6.7	13.9	.8	5.8	27.2	100.0
Computer Science, Systems, Engineering	47.5	7.9	12.6	9.5	77.5	9.8	7.1	*	5.7	22.5	100.0
Architecture, Fine and Applied Arts	28.3	12.7	17.6	13.0	71.5	8.3	13.0	1.3	5.8	28.5	100.0
Liberal Arts, Humanities, Business, Law, Social Science	26.1	12.0	15.7	13.5	67.4	8.1	17.8	2.0	4.7	32.6	100.0
Total[1]	29.0	11.8	16.1	12.7	69.6	8.0	15.7	1.6	5.0	30.4	100.0
Science and Engineering Sub–Total	35.1	10.1	17.4	11.2	73.8	7.4	12.5	.6	5.8	26.2	100.0

[1] Omits vocational.
* Less than one-half of one percent.
Components may not add to totals due to rounding.

Source: OPPE Survey of Class Schedules.

TABLE 4–5.—*Average Weekly Load Factor*[1] *By Type of Institution and Location: Spring Term 1968*

(Ratio)

Type of Institution	Location Center City	 Metro Area Other than Center City	 Outside Metro Area
Public			
University	.42	.76	.89
4–Year	.67	.72	.69
Less than 4–Year	.77	.74	.55
Tech	*	*	.69
Private			
University	.74	.55	.56
4–Year	.44	.44	.55
Less than 4–Year	*	*	*
Tech	.39	.57	.49

[1] Total number of class hours per week divided by 40 times the class hours for the peak hour during the week. For example, if the same number of class-hours were held each hour of each day 8:00 a.m. to 11:00 a.m. and 1:00 p.m. to 5:00 p.m., Monday through Friday, this ratio would equal 1. If additional hours were held outside the normal 8 hour day the ratio could exceed 1.

* Omitted because of small sample size.

Source: OPPE Survey of Class Schedules.

schools, and an explanation for this variation can be garnered by examining the experience of the Oklahoma State system, which has kept detailed records of instructional costs for faculty for a number of years.

Oklahoma State Regents for Higher Education[2] have compiled faculty salary costs per student/credit-hour by school, by discipline, and by level of instruction for a number of years. The analysis below is based on a comparison of costs incurred during the years 1962-63 and 1966-67.

Credit-hour costs have been grouped as science and non-science courses,[3] and further subdivided into lower level undergraduate (freshman and sophomore), upper level undergraduate (junior and senior), and graduate courses. The costs were analyzed three ways: (1) by institution, (2) by level of instruction, and (3) by a comparison of actual costs incurred and the costs which would have been incurred if the same credit-hours of instruction were offered at the University of Oklahoma, the largest unit of the State system. Since the data were compiled for two years some intertemporal comparisons are presented as well.

Overall costs by school. The costs per credit-hour by school varied by a factor of 1.5 in 1962-63, and by a factor of two in 1966-67. At the top of the cost spectrum, in both years, were the University of Oklahoma and Oklahoma State University, with costs some 20 percent above the average.

Costs incurred by different schools varied considerably between the two years. Costs grew most rapidly at the University of Oklahoma, because of increasing expense caused by all science and graduate non-science courses. In another school where costs increased quite rapidly, the increase was due to higher costs of upper division science courses, probably related to the digestion process caused by discontinuing graduate science programs. One two-year college with high costs in the base year had costs soar to even higher levels mostly as a result of the expenses incurred in building up its science program.

It is intriguing that three out of the 15 schools experienced cost declines, either as the course mix changed, or as their unusually high costs in earlier years were pulled down by growth without proportional cost increases.

If one looks at the system as a whole, one gets the impression of a star school, the University of Oklahoma, gaining strength all around, with a number of other well-established schools holding their own. A number of smaller schools have erratic changes in costs, partly due to growing pains, and partly due to living down high start-up costs (see Table 4–6).

Differences in credit-hour costs by level.—For the Oklahoma system, as a whole, upper division courses were 60 percent more expensive than lower division courses in 1962-63. The gap between these two types of courses widened to 90 percent in 1966-67. Graduate science courses were five times as expensive in 1962-63 as the average cost of lower

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[2] Coffelt, John J. *Faculty Teaching Loads and Student Credit-Hour Costs*, Oklahoma State System of Higher Education, 1962–63 and 1966–67 academic year, State Capital, Oklahoma City, 1964 and 1968.

[3] The following were grouped as science courses: Agriculture, Biology, Chemistry, (Engineering–Aeronautical, Agriculture, Architectural, Chemical, Civil, Electrical, Physical, Geological, Industrial Management, Mechanical, Metallurgical, Petroleum, Other), Geology, Pharmacy, Physical Science, Physics, Public Health, Veterinarian Medicine.

The following were grouped as non-science courses: Art, Business, Economics, Education, English, French, German, Greek, Hebrew, Italian, Japanese, Latin, Portuguese, Russian, Spanish, Foreign Language, Other, Funeral Service, Geography, Government, Health and Physical Education, History, Home Economics, Hotel and Restaurant Management, Humanities, Industrial Arts, Journalism, Law, Library Science, Mathematics, Technical-Vocational, Music, Nursing, Orientation, Philosophy, Psychology, Sociology, Social Work, Speech and Drama.

Table 4–6.—*Credit Hour Costs/Student in the Oklahoma Public Higher Education System by School 1961-62 and 1966-67*

(Dollars per credit hour/student)

Name of Schools	1961-62	1965-66	% Change
University of Oklahoma	11.68	15.95	58
Oklahoma State University	11.58	14.26	23
Central State College	8.37	9.40	12
East Central State College	9.03	10.56	17
Northeastern State College	7.65	9.32	22
Southeastern State College	8.94	11.92	33
Oklahoma College of Liberal Arts	16.23	13.97	−14
Panhandle A&M College	11.65	13.37	15
Langston University	11.53	11.26	−2
Cameron State Agriculture College	8.51	9.39	10
Connors State Agriculture College	10.03	10.88	8
Eastern A&M College	8.64	8.90	3
Murray State Agriculture College	13.88	10.54	−24
Northeastern Oklahoma A&M College	8.30	8.60	4
Northern Oklahoma College	9.39	12.54	34
Mean	10.55	12.78	21

Table 4–7.—*Credit Hour Costs/Student in the Oklahoma Public Higher Education System in 1961–1962 and 1966–67*

(Dollars per credit hour per student)

	1961-62	1966-67	% Change
All Divisions	10.55	12.78	21
Lower Division Science	7.97	10.03	26
Lower Division Non-Science	7.89	9.03	14
Upper Division Science	13.05	19.23	47
Upper Division Non-Science	11.91	14.12	19
Graduate Science	39.93	57.51	44
Graduate Non-Science	24.71	34.70	40

division science and the ratio of graduate to lower division was 5.8 to 1.0 in 1966-67.

In non-science courses, upper division courses cost half as much again in 1961-62 as lower division courses in 1961-62, and the gap remained about the same in 1966-67. This was not so in the cost relationship between lower division courses and graduate courses: the cost of non-science graduate courses was three times the cost of similar lower division courses in 1961-62, and went up to close to four times the credit-hour cost of courses in 1966-67.

As a general rule, the costs of upper division science courses increased fastest relative to lower level undergraduate costs, and graduate courses went up an average of 20 percent in terms of relative costs.

The costs per student credit-hour went up 21 percent for the whole system, with all undergraduate course costs going up 18 percent, and graduate level costs showed a 38 percent cost increase. The lowest cost increases occurred in undergraduate non-science courses, between 18 and 19 percent; the highest cost increases were in upper division and graduate science courses, 48 and 44 percent respectively (see Table 4–7).

Cost developments by school.—The relationships which held for the school system as a whole did not necessarily apply to the cost experience of a given school. Generally, schools which offered graduate programs incurred higher costs at all levels. For instance, upper division science courses at the University of Oklahoma cost 70 percent more than lower division courses, and graduate division science courses roughly 2.5 times the undergraduate science courses. In non-science, again upper division courses cost some 70 percent more, and graduate courses were three times as expensive.

The other major school with a graduate program, Oklahoma State University, incurred roughly 40 percent higher costs in upper level science courses than in the lower level in 1962-63, and by 1966-67 widened the gap to nearly 60 percent. By contrast graduate courses were six times more expensive than undergraduate lower level science courses in both years. In non-science courses the spread in costs between upper and lower level courses was narrower than at the University of Oklahoma, 50 to 60 percent. However, graduate credit-hour production per student cost six or seven times as much as lower level undergraduate credit-hours.

At Central State College, upper level science courses were twice as expensive as lower level courses, while upper level non-science courses were less expensive as compared to lower level courses in the two schools. Graduate courses cost roughly three times as much.

It is interesting to note that, in 1961-62, course costs per student credit-hour offered were no lower in the junior colleges than in the star of the system. By contrast in 1966-67, with one notable exception, the average increase in instructional costs was less in the junior colleges than in large schools, and in some instances it even declined. Apparently most of these schools admitted students faster than their budgets grew (see Appendix Table 4–1).

A comparison of standard costs. The relative change in costs incurred by school or by level could have been caused by changes in course mix as well as local budgetary considerations and admission policies. An attempt to adjust for these changes and restandardize costs by applying the cost experience at the University of Oklahoma is presented below.

Student credit-hours by discipline and by level (say, physics, chemistry, biology, etc. for science courses) were priced for all schools in the system by expenses incurred at the University of Oklahoma. A ratio of actual costs incurred to the "standard cost" was then calculated. It is reproduced in Table 4–8.

As a general rule, the University of Oklahoma had higher costs than most other schools in 1966-67. Compared to 1962-63, the University of Oklahoma became a relatively more expensive school. Especially in lower division science courses, the expenses at the University of Oklahoma were relatively much higher by 1966-67 than in the earlier period. In upper division science, only two small schools spent more per student credit-hour than the University. In graduate science, the high cost for Central State College is not significant. It produced 3,000 credit-hours at that level compared to Oklahoma's three-quarter million student credit-hours.

It is interesting that the costs of production in non-science courses show a much narrower spread. In some State institutions lower division non-science courses were more expensive than at the University of Oklahoma, but in all cases they were showing a downward trend. Only one institution had higher standard costs than the University of Oklahoma in graduate non-science courses, and even there it was coming down to University of Oklahoma levels.

If the experience of Oklahoma is typical, it would appear that (1) elite institutions tend generally to have higher costs, (2) these cost disparities are widening, and (3) two-year institutions with high start-up costs generally evolve to produce a "standard" credit-hour less costly than the elite institution.

Nation-wide Analysis of Instructional and Total Costs Per Students by Type of Institution.—The post-secondary instructional system has traditionally been subdivided into the public and private sectors, and each of these sectors has been subclassified into universities, liberal arts colleges, teachers colleges, two-year colleges, as well as specialized institutions lumped under the rubric of technical institutes, etc. The patterns of expenditures are examined, and the limitations of classifying institutions in the conventional manner are discussed below.

Diversity in expenditure levels by type of institution. One tends to be over-awed by the magnitude of outlays in higher education, and to consider this sector as a monolithic machine which dispenses knowledge and produces degrees at various levels in great quantities. Actually, this sector consists of a large number of institutions, the majority of them quite small, which provide "educational treatments" to a large number of students at vastly differing costs. These costs vary widely not only between public and private institutions but by type of institution, and also for institutions of a given type.

Roughly 55 percent of all current expenditures are consumed in delivering the primary function of post-secondary institutions: instructional services. In the discussion below educational expenditures were defined as the sum of outlays on instruction and departmental research, libraries, administration and plant operating costs. Excluded are expenditures for organized research, generally reimbursed by some outside agency, housing and food service outlays, extension and public service costs, other auxiliary services expenses, student aid expenses and other organized activities.

If one classifies colleges in the conventional manner, by type within the public and private sector—universities, four-year liberal arts colleges, four-year teachers' colleges, and two-year colleges,[4]—one cannot help but note the wide variation between types of institutions and between sectors. What is even more significant is the wide variation within a given class of institution.

Table 4–9 reproduces the mean expenditures per full-time equivalent student for 1961, 1963, and 1965 by type of institution. This table indicates that expenditures per student, as a rule, are higher in private than in public institutions,[5] that universities tend to spend more than four-year liberal arts colleges, which in turn have higher costs

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[4] Technical colleges are omitted from this analysis because they are usually single purpose in nature and do not lend themselves to grouping. Included in this category are professional law, medicine, art, and other such institutions.

[5] An exception is the private liberal arts college. Many of these schools are Catholic. The costs of religious faculties depress the total.

TABLE 4–8.—*Ratios of Actual/Inputed Credit Hour Cost/Student 1961–62 and 1966–67*

Institution	Total Schools		Lower Level Undergraduate Science		Lower Level Undergraduate Non-Science		Upper Level Undergraduate Science		Upper Level Undergraduate Non-Science		Graduate Science		Graduate Non-Science	
	1961–62	1966–67	1961–62	1966–67	1961–62	1966–67	1961–62	1966–67	1961–62	1966–67	1961–62	1966–67	1961–62	1966–67
1 University of Oklahoma	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2 Oklahoma State University	96	91	87	59	94	93	67	71	99	105	112	100	208	151
3 Central State College	89	71	89	36	102	90	115	65	72	70	0	277	94	69
4 East Central State College	91	80	78	35	112	103	107	83	76	80	35	28	58	45
5 Northeastern State College	76	66	54	24	102	95	52	57	65	65	0	0	46	24
6 Southeastern State College	83	68	84	37	95	90	125	95	77	62	41	0	41	36
7 Oklahoma College of Liberal Arts	151	111	140	89	182	113	140	89	128	144				
8 Panhandle A&M College	126	110	84	69	122	103	281	290	120	123				
9 Langston Univ.	113	91	87	66	115	96	132	182	114	84				
10 Cameron State Agriculture College	103	86	97	68	105	92								
11 Connors State Agriculture College	132	95	105	51	137	120								
12 Eastern A&M College	105	76	91	57	111	85								
13 Murray State Agriculture College	172	92	155	67	180	107								
14 Northeastern Oklahoma A&M College	100	81	91	45	102	95								
15 Northern Okla. College	117	112	111	89	118	117								
Total	97	88	90	58	104	96	82	84	90	88	107	100	113	101

TABLE 4–9.—*Estimated Educational Expenditures Per Full-Time Equivalent Student by Type of Instruction in 1961-62, 1963-64, 1965-66 in Dollars Per Student and as a Percent of Total Expenditures*

Type	Educational Expenditures Per Full Time Equivalent Student[2]			Educational Expenditures As A Percent of Total Expenses[2]		
	1961–62	1963–64	1965–66	1961–62	1963–64	1965–66
All Institutions	1098	1208	1245	.543	.539	.522
University–Public	1294	1388	1455	.475	.468[1]	.448
University–Private	1640	1922	2066	.453	.444[1]	.430
Liberal Arts Public	904	958	1012	.717	.714	.697
Liberal Arts Private	1053	1198	1270	.630	.630	.594
Teacher College Public	778	879	866	.689	.696	.668
Teacher College Private	979	1215	1306	.630	.600	.570
Junior College Public	576	631	652	.841	.848	.781
Junior College Private	806	850	918	.665	.670	.634

[1] For High Research Oriented Institutions in 1963–64, The Percent Educational Expenditures of Total Expenditures Less Research Expenditures Increased The Ratio For Public Institutions 9% And 29% For Private Schools.

[2] Institutional Means Weighted For Enrollment.

on the average than either teachers' colleges or two-year institutions.[6]

In the period 1961 to 1965 in public universities, in total, expenditures per student increased by 12 percent, while in private universities it increased by almost 30 percent. Liberal arts colleges saw outlays per student increase by 21 percent for private colleges and 12 percent for public colleges. Public junior colleges, which were the least costly sector of post-secondary education, saw their outlays per student grow by 13 percent. Educational expense per student in institutions which continued to devote themselves to the training of teachers increased some 12 to 21 percent in the four years, in line with the cost increases in liberal arts institutions. Costs in the public sector, irrespective of the type of institution, grew at close to 12 percent. Variations in costs in the private sector varied between 21 and 30 percent.

Since these institutions cater to different levels of students, with some of them educating undergraduates exclusively or predominantly, and others having a large and increasing proportion of graduate students, an additional analysis was performed which assigned a differential weight to graduate students. Costs per graduate student were imputed at a rate three times that for an undergraduate,[7] and a new estimate of costs was derived for the average "standard" undergraduate student (see Table 4–10).

When costs are adjusted to take into account higher outlays on graduate students, the four-year private institutions in all classes tend to provide a standardized "undergraduate" year of instruction, from $1,100 to $1,300 a year in 1965. Public four-year institutions tend to provide the same standard quantity at $1,085 in universities and about $825 in four-year colleges. Junior colleges which offer lower division undergraduate instruction tend to be lower-cost. Yet if one assumes, in line with the Oklahoma experience, that lower division courses are a third cheaper, the cost advantage of

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[6] Even more significant is the wide range of costs within a class of institution. In a detailed analysis not reproduced here, in most instances the standard deviations were at least one-half of the mean expenditures. In other words, two institutions within one standard deviation from the mean could have a relationship of one to three in their mean expense. The analysis of expenditure patterns, which analyzed mean expenditures of institutions by control, type, and size, did not reduce the variation between institutions. On the contrary, in many instances the mean and the standard deviations were equal, thus throwing serious doubt upon the meaning of conventional classification of schools.

[7] The imputed three to one cost of graduate education to undergraduate education is based on information from three sources:

1. An unpublished study conducted by the National Science Foundation in 1960 on the Relative Costs of Instruction.
2. State of Michigan cost data for higher education in 1962–63 and 1963–64.
3. State of Oklahoma study on faculty teaching loads and student credit-hour costs.

TABLE 4–10.—*Estimated Educational Expenditures Per Standard Undergraduate Student By Type of Institution in 1961–62, 1963–64, 1965–66*

(In dollars per student)

Type	Educational Expenditures Per Standard Undergraduate Student (S.U.S.)[1] 1961–62	1963–64	1965–66
All Institutions	909	941	1020
University–Public	991	996	1085
University–Private	1154	1113	1305
Liberal Arts–Public	750	790	840
Liberal Arts–Private	947	1030	1173
Teacher College–Public	688	769	791
Teacher College–Private	698	1044	1126
Junior College–Public	576	631	652
Junior College–Private	806	850	918

[1] Institutional means weighted for enrollment.

a junior college is not very pronounced.

A comparison of Table 4–9 and 4–10 gives a different impression of trends in outlays by type of school. When the expenditures per student are measured on a full-time equivalent basis it will be noted that costs remained roughly the same distance from the mean (see Table 4–11) in 1965-66 as compared to 1961-62.

It should be realized that the mean is the result of the changing composition of the post-secondary universe. As public schools enroll proportionally more students the costs are likely not to grow as fast. These schools generally have a lower expenditure per student than the private schools.

After graduate students costs are taken into account, the variability between the public and private sector is reduced, especially for private universities. The increases in costs there were mostly due to the concentration of graduate students in those institutions. In most cases, costs grew at pretty much the same rate, institution by institution, when heavier graduate student costs are taken into account.

Variations in Costs Adjusted for Price Changes.—A rough index taking into account changes in educational costs was constructed for the period 1961-62 through 1965-66. Its derivation is explained in Appendix G. It estimated that cost per unit increased approximately 8 percent between 1961-62 and 1963-64, and 18 percent in 1961-62 and 1965-66.

Once the per student costs are deflated by the price increase, for the system as a whole, outlay does not appear to have changed at all per full-time equivalent student between 1961 and 1965, and decreased very slightly per standard undergraduate student. Cost increases in private universities were mostly due to a greater concentration of graduate students, while in other sectors the average costs in constant dollars remained fairly constant (see Table 4–12).

Given the fairly large fluctuations within a type of school, which dwarf the fluctuations between types of schools, it may be safe to project educational expenditures for undergraduates in the future as an average of current educational expenditures modified by anticipated price increases.[8]

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[8] It will be noted that the expenditure per full-time equivalent student estimated by this study is roughly 15 percent below the one which will be derived from calculating the per student cost from a complete count of schools using published data. This understatement is due to the exclusion of high per student cost technical schools, especially medical schools and seminaries, from the coverage of this study. For purposes of projection, it appears that the figure calculated on an aggregate basis may serve the purpose of estimating future expenditures of the undergraduate sector of post-secondary system in a somewhat more accurate manner.

TABLE 4–11.—*Mean Estimated Educational Expenditures By Type of Institution as a Percent of Estimated Cost of All Institutions By Year Per Full Time Equivalent and Per Standard Undergraduate Student 1961–62, 1963–64, 1965–66*

Type of Institutions	1961–62		1963–64		1965–66	
	Ed Exp./ FTEE	Ed Exp./ S.U.S.	Ed Exp./ FTEE	Ed Exp./ S.U.S.	Ed Exp./ FTEE	Ed Exp./ S.U.S.
All institutions	100.0	100.0	100.0	100.0	100.0	100.0
University–Public	117.9	109.0	114.9	105.8	116.9	106.4
University–Private	149.4	127.0	160.9	118.3	165.9	127.9
Liberal Arts–Public	82.3	82.5	79.3	84.0	81.3	82.4
Liberal Arts–Private	95.9	104.2	99.2	109.5	102.0	115.0
Teacher College–Public	70.9	75.7	72.8	81.7	69.6	77.5
Teacher College–Private	89.2	87.8	100.6	110.9	104.9	110.1
Junior College–Public	52.5	63.4	52.2	67.1	52.4	63.9
Junior College–Private	73.4	88.7	70.4	90.3	73.7	90.0

TABLE 4–12.—*Estimated Educational Expenditures Per Full Time Equivalent Student and Per Standard Undergraduate Student By Type of Institution in 1961–62, 1963–64, 1965–66 Adjusted for Price Changes*[1]

Type and Control of Institution	Year	Ed. Exp./ FTEE[1]	Ed. Exp./ S.U.S.[1]
All Institutions	1961–62	1098	909
	1963–64	1114	868
	1965–66	1049	859
Universities–Public	1961–62	1294	991
	1963–64	1280	918
	1965–66	1226	914
Universities–Private	1961–62	1640	1154
	1963–64	1772	1026
	1965–66	1740	1099
Liberal Arts–Public	1961–62	904	750
	1963–64	883	729
	1965–66	852	708
Liberal Arts–Private	1961–62	1053	947
	1963–64	1105	950
	1965–66	1070	988
Teacher College–Public	1961–62	778	688
	1963–64	811	709
	1965–66	729	666
Teacher College–Private	1961–62	979	798
	1963–64	1120	963
	1965–66	1100	948
Junior College–Public	1961–62	576	576
	1963–64	582	582
	1965–66	549	549
Junior College–Private	1961–62	806	806
	1963–64	784	784
	1965–66	773	773

[1] Price Adjustments Based Upon The Following Index Developed By USOE-OPPE; 1961–2—100.00, 1963–4—108.44, 1965–6—118.72.

Student Subsidies.—This study has defined student subsidies as the difference between the tuition and fees paid by students and the educational expenditures defined at the beginning of the section. Table 4–13 shows the range of these differences by type of school, and also for all schools by range of tuition. It will be noted that the subsidy increased roughly 8 percent per full-time equivalent student or per standard undergraduate student between 1961 and 1965.

Between 1963-64 and 1965-66 the amount of the subsidies scarcely changed, either per full-time equivalent student or per standard undergraduate student. Apparently the major burden of cost increases was being shifted to tuition and fees borne by the students and was no longer shouldered by the institutions.

Public universities still subsidized their students at roughly 1.75 times the average for the nation in the case of the full-time equivalent calculation and about 60 percent above the average for the standard undergraduate student. In private universities the subsidy rate is very nearly equal to the national average when the calculation is made on a full-time equivalent basis and roughly 80 percent of the national average on a standard undergraduate cost basis.

In liberal arts colleges which are publicly controlled, the subsidy per full-time equivalent student is slightly above the national mean subsidy when calculated on a full-time basis or the stand-

TABLE 4–13.—*Estimated Subsidy*[1] *Per Full-Time Equivalent and Per Standard Undergraduate Student By (A) Type of Institution and (B) Range of Tuition for 1961/2, 1963/4, 1965/6*

	1961–2		1963–4		1965–6	
	Subsidy per FTEE	Per S.U.S.	Subsidy per FTEE	Per S.U.S.	Subsidy per FTEE	Per S.U.S.
A. Type of institution[3]						
All institutions	691	572	762	594	[2]746	612
University–public	1216	931	1269	911	1313	979
University–private	634	446	788	456	752	475
Liberal arts–public	720	597	743	613	793	658
Liberal arts–private	267	240	301	259	205	190
Teacher college–public	606	536	687	602	628	574
Teacher college–private	439	358	517	445	351	303
Junior college–public	453	453	484	484	542	542
Junior college–private	215	215	236	236	146	146
B. Level of tuition[3]						
1 to 250	803	687	823	702	812	723
251 to 499	930	760	969	731	1010	810
500 to 999	292	250	497	409	479	410
1000 up	651	476	649	424	488	354

[1] Subsidy is defined as the difference between tuition and educational expense.
[2] Preliminary data.
[3] Institutional means weighted for enrollment.

ard student basis. This is not so in private liberal arts colleges, where the subsidy is below the national average in all years, and, after a small spurt in 1963-64, is now below the 1961-62 level, less than one-third below the national average.

In 1961-62 and again in 1965-66 public teachers' colleges subsidized prospective teachers roughly 15 percent below the average on a full-time equivalent basis but only 6 percent on a standard undergraduate basis. By contrast, private teachers' colleges have been sharply reducing the subsidy to their students who now get about half the national average over and above their tuition and fee payments. Two-year public colleges, whose tuition and fees have remained at $160 per full-time equivalent student, saw their subsidies grow 20 percent during the past three years.

Is There a Crisis in Financing Higher Education?—The cost developments outlined above do not give a clear-cut answer as to whether there is a crisis in the financing of higher education. Certainly, expenditures have not been increasing in constant prices. The resources expended per standard undergraduate student were as high, but no higher, in 1965-66 as in 1961-62. There was a short intermediate spurt in expenditures between 1961-62 and 1963-64, and if one took that year as a yardstick for change, it would appear that the resources in 1965-66 were already somewhat more meager than in 1963-64.

The pressure on institutional finances is probably best highlighted by observing the subsidy per full-time equivalent student between 1961-62 and 1965-66. Out of a cost increase of $147 between 1961-62 and 1965-66, only $55 was shouldered by institutions and the remaining $92 made up by tuition increase.

To complete the picture, a word should be said about trends in student aid from institutional funds. Aid for full-time equivalent students from that source amounted to $69 in 1961-62, $78 in 1963-64, and $90 in 1965-66.[9] In other words, in the period between 1961-62 and 1965-66, during which expenditures increased a total of $147, the university shouldered $55 in increased subsidy and another $21 in increased student aid from its own resources. The burden of cost increases on the student and institutions was split fifty/fifty.

Distribution of Institutional Deficits in Relation to Tuition and By Income Quartile of Students.—An analysis of educational expenditures and subsidies by tuition and class of institution indicates that: (a) the number of institutions with tuition rates of less than $250 has probably been declining, and (b) a number of institutions in the $500 to $999 class raised their tuition considerably and are now classed as institutions charging $1,000 or more. Under those circumstances, it is difficult to compare the subsidy from one time period to another since different institutions are included in each class. On the other hand, the trends are not without interest.

In low-cost institutions (see Table 4–13), those with tuition under $250, the subsidy was roughly $690 per standard undergraduate student in 1961-62 and $723 in 1965-66. In institutions whose tuition and fees ranged from $251 to $499, the subsidy increased from $760 to $810. In the institutions in the next tuition and fee class, $500 to $999, the subsidy increased by $160 to roughly $410. By contrast, the subsidy in institutions with tuition over $1,000 declined from $476 to $354.

If one can generalize, the subsidy per student increased slightly at low-cost institutions. It has gone up somewhat more in higher cost, publicly run institutions. In the case of the middle-cost private institutions, a number of which are religious schools, the subsidy increased moderately as well. Other institutions, formerly in the middle ranges, have raised their prices considerably and are now included in the higher tuition group. As a result, the educational outlays in the higher tuition group have scarcely increased at all, in real terms, and only slightly in absolute amounts.

Subsidies by Socioeconomic Group.—A rough estimate of subsidies by socioeconomic group was made by adapting U.S. Census Bureau estimates of students by income, by level of tuition of the school and adding to them independent estimates of the socioeconomic composition of students in junior colleges.[10] The estimated attendance of students by income quartile was then prorated between institutions in varying tuition classes. This distribution appears in Table 4–14. The estimates of subsidies by tuition class were then applied to each tuition to calculate average subsidies per income quartile; these appear in the last column of that Table. Subsidies by income quartile do not differ strikingly from each other; they range from $660 for the lowest quartile to $586 for the highest.

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[9] It was estimated that $75 in 1966–67 came from institutional funds.

[10] This junior college estimate was derived by aging the entrants in junior colleges in the 1968 ACE survey by the appropriate quartile derived from the OPPE model.

These estimates are admittedly crude, both because of the method of allocation, category by category, and also because they do not tie down precisely the socioeconomic composition of a particular school. Nevertheless, they tend to indicate that the present subsidy pattern by income quartile of students does not favor the rich over the poor, if averages can be trusted.

TABLE 4–14.—*Probability estimates of undergraduate students by income quartile and range of tuition attending college and the mean subsidy per standard undergraduate student by range of tuition and quartile distribution in dollars*

		Range of Tuition				
		1–250	251–500	501–1000	Over 1000	Mean Subsidy in Dollars
Quartile Distribution	1	.051	.044	.023	.013	660
	2	.064	.063	.038	.031	632
	3	.054	.079	.026	.032	660
	4	.113	.145	.082	.144	586
Mean Subsidy in Dollars		723	810	410	354	612

Source: See Table 2–1 in Section 2.

5. Determinants of Quality of Higher Education

This section addresses itself to the vexing problem of trying to explain the relationship between student outcomes in higher education and measures of student and institutional quality. The student outcome variable is represented by the percentage of students who have been motivated to continue their studies beyond the Bachelor's degree. Two measures are used to represent this variable. First, the percentage of seniors who intend to take graduate courses; and second, Ph.D. production for the same school. These output variables are related to a number of input variables: the academic ability of the entering freshmen, the institutional expenditures per student, student faculty ratios and percentage of faculty with Ph.D.'s. The results below are based upon the experience of 273 institutions for which data were available on the ability of freshmen and on the proportion of seniors who expressed an intention to go on to graduate school.

Previous Studies—Attempts to measure the quality of post-secondary institutions.—Several previous studies have attempted to measure the quality of post-secondary institutions. Notably, a study of the quality of individual institutions by Bowker[1] produced a list of outstanding institutions based on such criteria as:

(1) the number of former Woodrow Wilson Fellows on the faculty;
(2) the number of Woodrow Wilson Fellows choosing the school;
(3) the number of American Council of Learned Societies Award winners on the faculty;
(4) the number of Guggenheim Memorial Fellows on the faculty;
(5) the number of National Science Foundation Fellows choosing the school; and
(6) the number of National Academy members and of Nobel Laureates on the faculty.

These criteria were used to evaluate graduate schools. The undergraduate schools were evaluated on the basis of Woodrow Wilson fellowships obtained by the school and doctorates earned by baccalaureate holders from each school. Bowker found that these criteria produced a list of schools consistent with Berelson's, "Graduate Education in the United States" rankings, which were based on an evaluation by departmental chairmen in arts and sciences across the country. Below the top twenty schools, Bowker's criteria included schools not contained in Berelson's list.

Another study which attempted to measure the quality of institutions was conducted by Nash and Nash[2] at the Bureau of Applied Social Research. It attempted to develop an index of quality based on the following measures:

(1) number of library volumes
(2) library books per student
(3) income received by the college per student
(4) faculty-student ratios
(5) proportion of faculty with doctors degrees

Both studies suffer from serious shortcomings. The first study by Bowker does not distinguish between large and small colleges and considers student outcomes only in the case of undergraduate institutions. The Nash study is concerned only with input factors, some of which are biased by size, and it completely ignores measures of output.

A third study by Astin[3] attempted to measure the effect of an institution's "excellence" on the intellectual development of students who enrolled. The "excellence" was measured by an index which consisted principally of (1) the average academic ability of entering students and (2) expenditures per student for educational and general purposes. The outcomes were measured by student scores on area tests on the Graduate Record Examination. After controlling for academic ability of incoming students, Astin found little relationship between the quality of an institution and student outcomes. Astin[4] also looked at Ph.D. production, institution by institution, to allow for the longer time span during which the effects of an education could become more manifest. Here again he found no strong relationship between environmental measures of the institution and Ph.D. production.

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[1] Bowker, Albert H., "Quality and Quantity in Higher Education," *Journal of the American Statistical Association*, 60 (1965), 1–15.

[2] Unpublished data compiled for the Office of Education.

[3] Astin, Alexander W., "Undergraduate Achievement and Institutional 'Excellence,'" *Science*, August 16, 1968.

[4] Astin, Alexander W., "'Productivity' of Undergraduate Institutions," *Science*, April 13, 1962.

Astin's "excellence" study can be criticized on two counts. First, the number of institutions and the student sample covered by the study were small. Only 669 students spread over 38 institutions were analyzed. Second, it was difficult to see how students with high achievement at the outset were influenced to move to even higher levels of achievement. The second study was also based on a small sample of matched pairs of 35 institutions. Nevertheless, Astin's studies represent the first attempt to relate outcomes to resources and student characteristics, and the present effort owes much to it.

Coverage of the Present Study.—The analysis presented below is based on 273 institutions of higher education. A list of the institutions appears in Appendix C. The institutions were not chosen randomly, but consisted of colleges and universities for which information was available on achievement levels of entering freshmen and the intentions of graduating seniors to continue on to graduate work. Public institutions are under-represented in this study, since only 12 percent of the institutions were publicly-supported schools; nearly one-half were private non-religious institutions, and the rest were private religiously-supported institutions. Roughly 40 percent of these institutions did not offer any graduate programs, while 60 percent had a graduate school. Roughly 30 percent of the institutions in the sample were women's colleges, 20 percent were men's colleges, the remaining half being coeducational institutions. The colleges in the study overrepresent institutions for women.

The institutions in this study appear to recruit above-average students compared to the universe of post-secondary institutions. For instance, the mean verbal and math SAT scores were 544 and 555, respectively, compared to the national mean of approximately 500. The expenditures per student in 1964 were $1,567 compared to the national average of $1,143. Tuition was much higher than the average: $1,122 per student compared to the $486 average. The average enrollment size was somewhat below the average for all institutions in the United States, 2,172 as compared to roughly 2,400. The faculty-student ratio of 14 students per faculty member is fairly typical of the U.S. average. The proportion of the staff with doctorates was somewhat above the average. As was mentioned earlier, schools for men were under-represented in this sample, accounting for 50 percent of the enrollment as compared to the national average of 60 percent. The characteristics of the 273 schools, categorized by control and level of program offered, appear in Table 5–1.

As was mentioned earlier, a number of college input variables were considered by this study. These factors are described below.

1. *Expenditures Per Student (E)*—Includes the following items from the current expenditures: general administration and general expense, instruction, departmental research, libraries, and operation and maintenance of the physical plant. Data were obtained from Office of Education statistics, for the fiscal year of 1964.
2. *Tuition Per Student (TU)*—Tuition and academic fees, not including room and board. Data were published by the Life Insurance Agency Association for the year 1964-65.
3. *Enrollment (EN)*—The enrollment data were obtained from the Office of Education series of "Opening Fall Enrollment in Higher Education, 1963." The full, part-time and extension degree oriented students were weighted by the values of 1, 1/3 and 3/5 respectively to obtain a full-time equivalent enrollment.
4. *Research Staff (RS)*—Full-time staff engaged in research. Data were obtained from "Faculty and Other Professional Staff in Institutions of Higher Education, 1963-64," OE-53000-64, Circular No. 794.
5. *Faculty-Student Ratio (FS)*—Equivalent full-time staff data obtained from the above publication. The ratio is of the equivalent full-time student enrollment (EN) and the equivalent full-time staff.
6. *Proportion of Faculty With Doctorates (FA)*—Decile rank of college on the proportion of the faculty with doctorates. Data were taken from the study completed by Nash and Nash in 1965, based on data from the American Council on Education and the Office of Education for the year 1964.
7. *Percent Male (PM)*—Ratio of male students to total students obtained from the same data source used to determine the weighted enrollment (EN).
8. *Percent Teacher (PTU, PTG)*—This variable

TABLE 5–1.—*Characteristics of schools by control and level of program offered*

Variable				Graduate Program						Undergraduate Program (ONLY)					Combined	
		All Colleges N =273		Public N =28		Private Non-Religious N =67		Private Religious N =62		Private Non-Religious N =32		Private Religious N =80		Public N =32	Private Non-Religious N =99	Religious N =142
		Mean	Stand. Dev.	Mean	Stand. Dev.	Mean	Stand. Dev.	Mean	Stand. Dev.	Mean	Stand. Dev.	Mean	Stand. Dev.	Mean	Mean	Mean
Verbal Mean.............	VM	544	60	498	45	595	58	530	39	577	54	515	44	501	589	522
Math Mean..............	MM	555	65	528	54	614	65	538	45	582	51	519	43	527	604	527
Expenditures.............	E	1567	790	1241	395	2244	1066	1288	635	1737	460	1281	382	1240	2080	1284
Tution...................	TU	1122	453	393	239	1515	405	1060	249	1421	258	1014	265	392	1485	1034
Enrollment...............	EN	2172	3022	6716	5661	2061	3045	2012	1677	973	457	842	399	6105	2075	1353
Student Teacher Ratio......	ST	14	4	18	7	11	4	14	3	13	4	14	3	18	12	14
Proportion of Staff With Doctorate (Decile)........	FA	7	3	6	2	8	3	6	2	9	2	6	2	6	8	6
Percent Male.............	PM	50	36	61	25	58	36	54	37	46	33	38	34	57	54	45
Research Staff............	RS	30	143	92	221	75	237	9	35	.1	.4	1	12	81	51	4
Percent Teacher Undergraduate..........	PTU	5	5	9	7	2	3	4	4	3	3	6	4	9	2	5
Graduate...............	PTG	11	66	21	26	8	16	30	133	0	0	0	0	18	5	13
Percent to Graduate School..	PG	39	19	35	21	45	20	39	18	45	18	33	17	34	45	36
Number of Ph.D.s 1920–66..	PH	226	421	360	381	485	715	130	134	153	141	75	84	322	378	99
Number of Ph.D.s 1920–59..	PB	145	286	216	246	321	493	75	80	106	96	49	57	193	252	60
Number of Ph.D.s 1960–66..	PA	81	143	144	143	164	237	55	57	47	47	26	30	129	126	39
Expenditures Minus Tuition.	EMT	445	648	848	294	729	938	228	569	316	390	267	381	848	595	250

measures the degree to which the college is geared to the production of teachers. Ratios were obtained from the percent of undergraduate students (PTU) and the percent of graduate students (PTG) who received their respective undergraduate or graduate degrees in the field of education. Data were obtained from the publications, "Teacher Productivity—1965," American Association of Colleges for Teacher Education, Washington, D.C., 1966, and "Resident and Extension Enrollment in Institutions of Higher Education, Fall 1963," OE-54000-63.

9. *Scholastic Aptitude Test Scores (VM, MM)*—Verbal (VM) and mathematical (MM) school means of the Scholastic Aptitude Test (SAT) taken by the enrolled freshmen class in fall of 1964.
10. *Percent to Graduate School (PC)*—Percent of college seniors receiving their degrees June 30, 1963, who expected to go on to graduate school. Data published in "American Universities and Colleges" American Council on Education, 1964, 9th Edition.
11. *Number of Doctorates (PH, PB, PA)*—Number of Ph.D.'s who received their doctorate during the years 1920-66 (PH), during the years 1920-59 (PB), and during the years 1960-66 (PA) and did their undergraduate work at the given institution included in the sample. Data were published in "Doctorate Recipients from United States Universities 1958-66," National Academy of Sciences, Washington, D.C., 1967.

Input and output measures categorized by control and level of program offered are presented in Table 5–1. Examination of this table reveals that:

(a) Private non-religious, private religious, and public schools rank in that order for the following input variables: student achievement, expenditures, tuition, faculty-student ratio, and proportion of faculty with doctorates. Expenditures per student are appreciably higher for the private non-religious schools than for the other classes of schools.

(b) Private non-religious, private religious, and public schools rank in that order for the output measures of percent to graduate school and Ph.D. production. Ph.D.'s produced during the years 1920–66 are appreciably higher for the private non-religious (relative to size) than for the other classes of schools.

(c) A rough measure of the subsidy provided by the institution to the student is given by the difference between expenditures per student and tuition. This subsidy is largest for the public schools. The private non-religious schools have the next largest subsidy, and private-religious schools have less than one-third the subsidy of the other two classes of schools.

The intercorrelation matrices for the set of input and output variables for the whole sample and the five subsamples are shown in Appendix D, Table D–1 through Table D–6. Evidence of the homogeneity of our institutions of higher education is shown in the correlation tables. For example, the minimum correlation is .31 between the input variables of SAT scores, expenditures per student, tuition, faculty-student ratio and the proportion of staff with doctorates, for the entire sample of schools. Similarly, the output measures are, for the most part, significantly related to the individual input variables. This multicollinearity effect influences the inferences that might be drawn from the regression analysis below.

Results of the Regression Model.—A linear regression model was used to attempt to explain the percentage of seniors going on to graduate school and the Ph.D. production of the school during two-time periods. Regressions were run for each of the three outcome variables, percent of senior class going on to graduate school (PG), and the number of Ph.D.'s produced by the institution during the years 1960-66 (PA) and 1920-66 (PH). All listed input variables for the different classes of schools were used as independent variables. The results are summarized in Table 5–2 for different kinds of schools: public, private, religious, non-religious, with and without graduate schools. Only the variables which were significantly related to the output measures are indicated in the table. The regression coefficient and its standard deviation along with the percent of variation uniquely explained by that particular input variable are shown.

Percent to Graduate School and Input Variables.—The first portion of Table 5–2 shows the relationship between the percent of senior class expecting to go on to graduate school and the input variables. For the entire sample of schools the results indicate that the input variables of student achievement, expenditures, percent male, and percent baccalaureate graduates who receive degrees in teacher education significantly affect the student outcome.

TABLE 5–2.—*Regression analysis—Significant variables: coefficients, standard deviations, percent variation uniquely explained*

Variable		Percent to Graduate School (PG)						Number of Ph.D.s 1960–66 (PA)						Number of Ph.D.s 1920–66 (PH)						
		All Schools	Public, Graduate	Private, Non-Religious Graduate	Private, Religious Graduate	Private, Non-Religious No Graduate	Private, Religious No Graduate	All Schools	Public, Graduate	Private, Non-Religious Graduate	Private, Religious Graduate	Private, Non-Religious No Graduate	Private, Religious No Graduate	All Schools	Public, Graduate	Private, Non-Religious Graduate	Private, Religious Graduate	Private, Non-Religious No Graduate	Private, Religious No Graduate	
Verbal Mean (VM)	(a)	.28		.52																(a)
	(b)	.06		.08																(b)
	(c)	6		23																(c)
Math Mean (MM)	(a)	−.16		−.37				.63				.85	.49						1.40	(a)
	(b)	.05		.07				.24				.42	.23						.68	(b)
	(c)	2		17				1				5	3					N	3	(c)
Expenditures (E)	(a)	.004						.042		.059			.018	.113		.167		O		(a)
	(b)	.002						.008		.090			.008	.028		.069		N		(b)
	(c)	1						2		3			3	2		2		E		(c)
Enrollment (EN)	(a)							.023	.019	.04	.026		.033	.071	.038	.152	.058		.094	(a)
	(b)							.002	.003	.07	.004		.009	.006	.009	.017	.009		.026	(b)
	(c)							14.	19	20	26		9	14	11	28	25		9	(c)
Student Teacher Ratio (ST)	(a)				−1.70		−2.26						−3.52	−11.19					−8.1	(a)
	(b)				.74		1.07						1.40	4.70					4.1	(b)
	(c)				6		5						4	1					3	(c)
Percent Male (PM)	(a)	.370		.59	.213	.350	.251													(a)
	(b)	.049		.08	.096	.015	.121													(b)
	(c)	14		32	5	13	5													(c)
Research Staff (RS)	(a)							.286		.277				.670						(a)
	(b)							.037		.070				.124						(b)
	(c)							5		5				3						(c)
Percent Teacher	(a)	54.4	49.7																	(a)
Baccalaureates (PTU)	(b)	.3	.5																	(b)
	(c)	3	37																	(c)
Correlation	(a)	.61	.86	.81	.68	.71	.48	.87	.96	.92	.84	.86	.75	.83	.95	.89	.84	.86	.73	(a)
R	(b)																			(b)
	(c)																			(c)

CODE:
(a) Regression Coefficient
(b) Standard Deviation
(c) Unique Variation Explained

The variables as a total explained 37 percent of the variance, with the multiple regression coefficient being .61.

No explanation is needed for the inclusion of the variables for verbal and math SAT scores or expenditures per student. The inclusion of the factor to control for the sex composition of schools may need a further word of explanation. As a general rule, fewer women continue in graduate school than do men. The exception is probably teacher education majors. A large number of teachers continue to take post-baccalaureate courses in order to keep up their certification and to progress in the pay structure. The introduction of the variable of the share of baccalaureates in teacher education, for instance, improved considerably the predictive role of the variables in public institutions which have a heavy infusion of education majors.

For the sample as a whole, the percentage of males in the schools accounts for 14 percent of the variability in graduate school; the orientation of the school to teacher training, three percent; the achievement of students, eight percent; the expenditure level, only one percent. Keeping in mind all the limitations of regression analysis, it would appear that student selection has a much greater influence on student outcomes than the level of expenditures despite the strong intercorrelation between variables. Due to the high intercorrelation of the variables, it would be rash, however, to conclude that the other variables are not significant contributors to the strengthening of students' motivation to continue studies. The high intercorrelations indicate, in effect, that one variable may be substituted for another or a group of others without appreciably affecting the overall explanatory power of the model. With the exclusion of such variables as tuition per student, research staff, proportion of faculty with doctorates, and percent of baccalaureate holders in teacher education, the regression equation yields the same overall correlation to two decimal places. In this reduced model, the results of which are shown in Table 5–3, the faculty-student ratio becomes significant in explaining one percent of the variation.

TABLE 5–3.—*Percent Senior Class Going On to Graduate School*

Variable	Coefficient (Standard Deviation)	Percent Variation Explained
Verbal Mean...........	.27 (.05)	6
Math Mean............	−.16 (.05)	2
Expenditures...........	.0036 (.0017)	1
Enrollment.............	−.0002 (.0003)	.05
Percent Male...........	.365 (.048)	14
Student Teacher Ratio...	−.60 (.29)	1
Percent Baccalaureates in teacher education.....	.963 (.254)	3
R.....................	.61	.....
R^2....................	.37	.....

The regression model shows that the relative importance of specific variables differs by type of institution. The dominant variable in motivating graduate students towards public universities that have graduate schools is the orientation to teacher education. In the more selective private non-religious schools with graduate departments, the motivation to attend graduate school is strongly related to SAT scores. In these schools SAT scores account for 40 percent of the variation. The negative correlation of the math SAT scores may be due to high intercorrelation with verbal scores or the ability of technically oriented students to enter occupations where graduate school is not important. The private religious schools have the most significant correlations with faculty-student ratios and percent male, each explaining approximately five percent of the variation. Apparently, these schools are more homogeneous in inputs and differ in the effect produced primarily by intensity of effort.

Ph.D. Production and Input Variables.—The relationship between input variables and the production of Ph.D. degrees is also shown in Table 5–2. In this model, Ph.D. production is strongly related to the enrollment size of the school and the absolute size of the research staff. Size, in general, appears as an important explanatory factor for Ph.D. production, accounting for eight to twenty-eight percent of the variation in number of Ph.D's over all classes of schools. In the private non-religious schools with no graduate program, size is not important. This is due to the fact that all schools in this sample have approximately the same number of students. For the total population considered in this study, math ability and expenditures also appear to be significant. Combined, these factors explain approximately 75 percent of the variation in the production of Ph.D.'s during the years 1960-66.

For private non-religious schools with no graduate programs there is a significant linear relationship with the entire set of variables, yet no single variable explains the production of Ph.D.'s during the years 1920-66. In a reduced model (see Table 5–4) which includes math mean, expenditures, enrollment, percent male, and the proportion of faculty with doctorates, math mean and enrollment explain 27 percent and eight percent of the variation respectively. There is no reduction in the explanatory power of the model (74 percent).

TABLE 5–4.—*Number of Ph.D.s 1920–66—Dependent Variable*

Variable	Coefficient (Standard Deviation)	Percent Variation Explained
Math Mean	1.88 (.36)	27
Expenditures	.0242 (.0447)	.3
Enrollment	.0889 (.0328)	8
Percent Male	.442 (.491)	1
Staff with Doctorate, Decile Rank	10.3 (9.69)	1
R	.86	....
R^2	.74	....

For private religious schools with no graduate department (referring again to Table 5–2, the ability of students (three percent), expenditures (three percent) and the faculty-student ratios (four percent), are significant in explaining Ph.D. production during the years 1960-66. For public and private religious institutions with graduate schools, enrollment (19 percent and 26 percent respectively) alone is a significant variable.

These results seem to indicate that there is some ordering of ability, expenditures, and intensity of instruction in the smaller religious-oriented schools. There is no such ordering in larger public and private religious schools with graduate departments. In the private non-religious schools, size (approximately 24 percent) and expenditures (approximately three percent) explain Ph.D. production. This may be due to the high intercorrelation of other factors with these variables. The lack of correlation with student ability is due to the fact that the majority of these institutions have high ability students with a SAT mean of 600 or more.

Analysis of Exceptional Schools.—The reasonableness of the model can be tested by looking at institutions which fall outside of the confidence band of the prediction. For instance, only the four schools listed in Table 5–5 were one standard deviation above the regression line which predicted the expected share of students who would go to graduate school. One of the schools is an engineering school, one is a teacher-oriented institution, and two are small private religious colleges. Of these, one is high on expenditures per student and the second has a high proportion of faculty with Ph.D.'s. No schools were significantly below the norm.

In the production of Ph.D.'s, exceptional schools fall in a pattern which could be expected. Table 5–6 shows the schools above the norm. Chicago, Cornell, MIT, and Yale are three standard deviations above the norm. These schools have good students (the lowest of them has a mean SAT score of 619); they spend a large amount of money per student, and they tend to have large enrollments. Further, they are in the top percentile of schools in terms of faculty with Ph.D.'s. They have a student-teacher ratio below the norm, and their student body is two-thirds male. The other schools which produce more Ph.D.'s than expected also have at least one of these characteristics.

Low Ph.D. producers are shown in Table 5–7. Three of these, Yeshiva, California Tech., and the Newark College of Engineering, are special cases. One is a religious school where a liberal education is given to prospective rabbis. The two others are engineering schools. Ph.D.'s are not common in the engineering profession. Two other schools, Brandeis and Michigan State, are either newly established or have recently experienced a high growth in enrollment.

TABLE 5–5.—*Exceptional schools: Percent to graduate school—High*

Name of Institution	Characteristics												CODE	STANDARD DEVIATION
	VM	MM	E	TU	EN	ST	FA	PM	RS	PTU	PTG	PG		
Upland College	461	483	2776	1005	109	6	3	50	0	0	0	90	1	2.6
University of Bridgeport	503	512	814	950	4604	19	3	53	0	3	34	80	1,3	2.4, 1.2
Newark College of Engineering	510	624	1051	436	3727	11	2	99	0	0	0	90	1	2.0
Good Counsel College	509	491	748	885	480	13	6	0	0	5	0	60	1	1.9

CODE
1. All Colleges
3. Private Non-Religious Graduate.

TABLE 5–6.—*Exceptional schools: Production of PH.D.'s—High*

							Characteristics										
Name of Institution	VM	MM	E	TU	EN	ST	FA	PM	RS	PTU	PTG	PA	CODE	STAND. DEV.	PH	CODE	STAND. DEV.
Chicago	657	667	3678	1710	7201	8	10	64	207	1	5	853	1,3	4.8,1.2	3594	1.3	7.5,2.0
Cornell	619	669	3867	1800	12876	9	10	75	393	1	5	985	1	4.0	2943	1	3.8
MIT	674	745	4695	1700	6862	6	10	96	1490	0	0	1173	1	3.4	....	....	....
Yale	655	695	3397	1800	8162	8	10	100	207	0	23	718	1	3.1	2244	1	3.1
Swarthmore	682	696	2889	1760	992	8	1	54	0	1	0	311		1.8	781	1	1.2
Carnegie	586	636	2143	1450	4081	11	10	68	59	2	0	351	1	1.5	....	....	....
Columbia	651	684	3145	1734	17195	7	10	99	521	0	14	837	1	1.3	2728	1	2.1
Notre Dame	563	612	1472	1415	6677	13	10	100	40	0	12	339	1,4	1.2,1.5	724	4	1.1
Rensselaer	597	700	2081	1885	3797	12	9	98	50	0	0	364	1	1.4	....	....	....
Wheaton, Illinois	583	605	707	1154	1778	15	7	52	0	7	0	167	1,4	1.3,1.1	....	....	....
Ohio Wesleyan	562	562	1564	1840	2161	13	9	50	0	6	0	....	....	....	513	4	1.3
St. Olaf's	558	585	1163	1150	2061	14	8	50	0	7	0	153	6	1.4	414	6	1.1
Upland	461	483	2776	1005	109	6	3	50	0	0	0	146	6	1.5	....	....	....

CODE
1. All Colleges
3. Private Non Religious Graduate
4. Private Religious Graduate
6. Private Religious No Graduate

2

TABLE 5–7.—*Exceptional schools: Production of PH.D.'s—Low*

Name of Institution	VM	MM	E	TU	EN	ST	Characteristics FA	PM	RS	PTU	PTG	PA	CODE	STAND. DEV.	PH	CODE	STAND. DEV.
U. of Pittsburgh	549	572	2335	1400	10333	12	8	67	1124	2	14	306	1	3.3	1134	1	1.7
Johns Hopkins	632	679	2454	1600	4993	5	6	100	1133	0	4	281	1,3	2.9,1.1	1012	1	1.4
Michigan State	609	595	1543	328	28188	22	10	57	398	8	16	565	1	2.2	1290	1	2.8
Yeshiva	558	577	4989	1275	2930	4	2	100	150	1	9	133	1	1.7	248	1	1.8
Brandeis	663	658	3706	1775	1828	7	10	52	84	0	0	74	1	1.5	81	1	1.8
Cal Tech	676	748	7825	1860	1357	6	10	100	206	0	0	366	1	1.1			
Georgetown	601	604	1402	1350	6184	8	2	76	157	0	0	90	1	1.3	239	1	1.1
Newark C. of Eng.	510	624	1051	436	3727	11	2	99	0	0	0	49	1	1.1			
Virginia	578	631	1464	427	8782	16	4	94	105	1	28	164	1	1.1			
Colorado S. U.	471	495	1589	358	14747	36	9	65	65	5	15	233			461	1	1.2

CODE
1. All Colleges
3. Private Non-Religious Graduate

Conclusions.—Factors other than the ability of entering freshmen, the expenditure per student, and the ratio of males enrolled to the total student population motivate students to follow through with graduate studies. The percentage of students going to graduate schools is high not only in schools which are elite in character, but also in those which are small religious institutions. Without a more detailed study of the characteristics of these schools, department by department, one cannot determine the specific factors that affect student outcomes.

The production of Ph.D.'s as a measure of outcomes yields clearer results. In a number of schools, such as private non-religious institutions, where the retention rates are relatively high, the productivity is fairly strongly related to expenditures.

Even this observation must be accepted with caution because of the multicollinearity between the input variables: schools which attract good students spend much more per student than the others. Similarly, schools which spend a great deal per student have a low teacher-student ratio and a high proportion of Ph.D.'s on their faculty.

In summary, (1) given a level of ability, a student who attends an institution with higher expenditures per student is more likely to go on to a Ph.D. than one who does not. (2) The continuation of a student to graduate school also depends upon his major and the type of institution he attends. (3) Student ability plays an important role in explaining the percentage of students going on to graduate school and Ph.D. production. (4) The ability factor is much more important, if coefficients are to be trusted, than expenditures per student. (5) If this finding is to be credited, recruitment of talented students is likely to pay off more than school subsidies.

6. Admission Policies, Costs, and Growth Rates of Colleges: 1961-62 to 1965-66

The precipitous growth of higher education enrollments, which amounted to 45 percent between 1961-62 and 1965-66, was unevenly distributed between public and private colleges. While enrollments in publicly controlled institutions grew by 55 percent, enrollment in privately controlled schools increased by only 25 percent.

This section examines how this differential growth in enrollments affected the admission policies of different types of institutions of higher education and what happened to admission standards, tuition, costs, subsidies per student and the incremental cost per student. Questions have been asked such as: (1) Has the pressure on enrollments increased the admission standards of established colleges and universities? (2) Have costs gone up differently in institutions catering to gifted students than in those institutions that enroll students with lower test scores? (3) What has been the incremental cost of expanding enrollment in institutions in the public and private sector?

The study is based on the examination of the records of 101 institutions for which data on SAT freshmen scores were available for both 1962 and 1966. The sample is not representative of the universe of post-secondary education. Private small liberal arts colleges predominated among schools which used the SAT tests in 1962. Hence, the population in this study consists of 70 smaller institutions of higher education with a mean enrollment of 1,071 in 1962 and an enrollment of 1,312 in 1966, and 24 large private institutions with a mean enrollment of 5,792 in 1962 and 6,929 in 1966. In addition, information was available on only seven large public institutions which had a mean enrollment of 12,545 in 1962 and 15,590 in 1966. A detailed description of the data used for this study and a list of institutions appear in Appendix E.

The mean SAT's of entering freshmen in 1962 was 536 in the 70 small institutions and 600 in the 24 large private colleges and 522 in the seven large public schools. By 1966, the mean SAT scores had increased slightly to 562 in the 70 smaller schools, to 619 in the 24 large private universities, and to 558 in the seven large public colleges. The SAT scores for the entire sample were correlated at .91 between 1962 and 1966. These differences, although small, are statistically significant.

Since for most institutions, roughly 85 percent of the students are above the institution's median minus 80 SAT points, an examination was made to determine whether, as a result of the enrollment pressure, less able students were increasingly excluded by admission officers in the schools in the sample. The findings presented in Table 6–1 indicated that the mean scores at the fifteenth percentile of the students admitted to those schools did not differ significantly between 1962-66 for either the large or small schools.

TABLE 6–1.—*Scholastic Aptitude Test Scores*, Median and Fifteenth Percentile, For Entering Freshmen 1962 and 1966*

Entering Year	Institutional Size			
	Median		Fifteenth Percentile	
	Small	Large	Small	Large
1962	542	580	462	497
1966	569	604	492	520
Change	27	24	30	23
Sample Size	70	31	70	31

* Represents the average of the verbal and math SAT medians.

Growth and Quality of the Freshman Class.—As a general rule, schools which catered to less able freshmen grew faster than did schools which catered to the more gifted entering students. (The regression equations for the 70 small schools and 31 large schools are shown in equation 1 reproduced in Appendix E.) The change in the SAT scores explained roughly 15 percent of the variance in the case of the 70 small schools and 30 percent of the variance in the growth of enrollment in large schools. A simpler way of looking at these relationships is presented in Table 6–2. This table shows the increase in enrollment by SAT of freshmen for public and private schools for the period 1961-65. In the private school sector, the one for which we have the most observations, it is interesting to note that the schools catering to the average student, (SAT's between 500 and 550) grew 28 percent while those catering to the elite (650 and up) grew only 12 percent.

The high correlation between the SAT scores of freshmen in 1962 and 1966 leads to interesting inferences:

(1) Most talented students still manage to find places in quality schools, and
(2) Much of the increasing enrollment consisted of students with low SAT scores, who were accommodated by institutions which had accepted similar types of freshmen before the enrollment increase started straining the facilities of all institutions.

Table 6–2.—*Percentage Change in Enrollment By SAT Level for Institutions of Higher Education, 1961 to 1965*

SAT Score Interval	Control Number of institutions	Public	Number of institutions	Private
400–499.......	..	..	8	30
500–549.......	5	39	25	28
550–599.......	2	28	30	25
600–649.......	..	..	18	17
650 and above..	..	..	13	12
Total number of institutions...	7	..	94	..

Developments in Cost and Expenditures.—Postsecondary institutions spend more to educate gifted students than they do to educate less-gifted ones. Both in 1961-62 and 1965-66, 50 percent of the variation in expenditures for the 70 small schools and the 31 large universities was explained by SAT level. If anything, the gap between what was being spent on gifted and less-gifted students widened between 1962 and 1966. (The predictive equations are shown in Appendix E.)

The amount spent per average freshman (SAT = 550) in the small school sample was $1,553 in 1962 and $1,642 in 1966. For the gifted freshman (SAT = 650) it was $2,227 in 1962 and $2,560 in 1966. While the cost of educating the less gifted went up $89 per student or six percent, for the more able the cost went up $333 per student or 15 percent.

The increases in cost are also very well ordered when the private schools are ranked by type and ability of entering freshmen. Table 6–3 shows the increase in cost per student between 1961-62 and 1965-66 by SAT level of entering freshmen. More exclusive schools increased their costs more than those with less-gifted freshmen, and the differences are dramatic when looked at both in percentages and in absolute terms.

Table 6–3.—*Percentage Change in Per Student Expenditures By SAT Level for Institutions of Higher Education, 1961 to 1965*

SAT Score Interval	Control Number of institutions	Public	Number of institutions	Private
400–499.......	.	..	8	21
500–549.......	5	17	25	21
550–599.......	2	10	30	24
600–649.......	.	..	18	20
650 and above..	.	..	13	45
Total number of institutions...	7	..	94	..

The subsidy per student, which is defined here as the difference between instructional costs and tuition, is positively related to the ability of the student. (The regression equations are shown in Appendix E, equations 4 and 5.)

An interesting analysis of the variations in expenditures, tuition, and subsidy appears in Table 6–4. Between 1961 and 1965 the average increase in tuition in public schools was roughly 21 percent, while expenditures per student increased 14 percent. Despite the tuition increase, the average subsidy per student increased 11 percent or $134. In the large private schools, tuition and expenditures increased by approximately 30 percent, and the subsidy grew by 28 percent to amount to $275 per student. Despite the increase in tuition, the large private institutions incurred a much larger deficit than hitherto. By contrast in the small private schools, expenditures grew by 20 percent, tuition by 30 percent, and the subsidy per student declined by $27.

At least for our sample, large private institutions appear to have charged $65 more per student in 1961, and $72 more in 1966, than small private institutions. The difference between the tuition charged by large private and large public schools increased from $650 to $860.

The slower growth in enrollment of the 70 small institutions (24 percent) and the large private in-

TABLE 6-4.—*Change in expenditures and tuition per student for institutions of higher education, 1961 to 1965*

(Dollars)

	Public Schools Large		Private Schools Large		Private Schools Small	
	1961	1965	1961	1965	1961	1965
Expenditures	1,622	1,851	2,070	2,655	1,409	1,685
Tuition	436	531	1,085	1,395	1,020	1,323
Subsidy	1,186	1,320	985	1,260	389	362
Change in Subsidy 1961–65	134		275		−27	
Percent Change in Subsidy 1961–65	11		28		− 7	
Sample Size	7		24		70	

stitutions (20 percent) as compared to 35 percent growth in enrollments in large public institutions indicate that the private post-secondary sector may be pricing itself out of the market. The situation appears to be especially serious for large private institutions which are both pricing themselves out of the market and losing considerably more money per student than ever before.

The Incremental Cost Per Student.—Does the salvation of private institutions lie in expanding enrollment and reducing the incremental cost for additional students? The answer is no, if they continue to be run as they are today. The incremental cost per additional student was calculated by inflating the 1962 cost by a factor representing the salary increases in average private institutions. Those were 31 percent per capita for the private institutions as compared to roughly 25 percent for the public institutions. If these cost factors are correct, the incremental cost per additional student enrolled between 1962 and 1966 is close to $2,400 per student in large private institutions. In the case of the large public institutions, the incremental cost per student is $1,200 or roughly two-thirds of the average cost in 1966. In the case of small private institutions, the incremental cost comes to $970 as compared to $1,685, the total expenditure per student in 1966.

Conclusions.—The limited survey of 101 institutions has indicated that colleges and universities appear to have expanded enrollments proportionate to increased demand for their services, given the type of populations they were established to serve. As a rule, institutions which cater to more gifted students increased their expenditures more than those which enroll freshmen from the lower ability quartiles.

The financial policies and the management of the different types of institutions appear to differ radically. In large private quality schools, expenditures increased proportionately to enrollment, as the cost increases were taken into consideration. In the small private schools, the incremental cost per student was less than the average cost as size increased. Incremental costs were also less than average costs in large public schools. There the average incremental cost per student was roughly two-thirds of the average expenditure.

On the whole, the post-secondary educational system deserves recognition for responding to the demands of the market. Apparently students of similar ability enrolled in similar institutions in both 1962 and 1966.

Other issues raised in this paper go beyond this observation. To what extent is the larger subsidy for gifted freshmen justifiable? And if it is, how much further can large private institutions increase their deficits, or raise their tuition, and still draw these students? The same questions can be asked of small private institutions in connection with their policy of raising tuition. For public institutions, the implications of growth are equally clear cut—**the question is how much of the general taxing power of the State can be mobilized to keep up the subsidies to selected segments of the State's population.**

Part III

In this part we deal with two issues which cut across the financial and attendance patterns described above, graduate education and discussions of the pros and cons for general aid.

7. Graduate Education

In the past year, two issues have dominated the discussion about Federal policy for graduate education: (1) the level of Federal support to graduate students, and (2) the impact of the draft on graduate enrollments. In a way, the discussion has not been consistent: While some complained about the decline of programs for graduate support and expressed concern about the number of students who could be supported, others feared that the number of graduate students would be greatly reduced by the draft. The concerns of university administrators are inconsistent if they worry simultaneously about the lack of students and the lack of fellowships.

A similar lack of consistency appeared to characterize the discussion of Federal institutional support for graduate students. There was concern that the Federal reimbursements for graduate students who were financed by university fellowships did not come anywhere close to the costs incurred by these institutions. At the same time, it was said that the reduction in the number of graduate students in science was likely to produce even larger deficits for institutions which catered to their instruction. It appeared as if fixed costs incurred by graduate schools could not be shifted to the growing undergraduate departments.

These arguments will be examined in this section, after the more general issues of financing graduate students are sorted out. The issues are extremely complex because Federal support of graduate education has many facets: (1) several Federal agencies provide fellowships and traineeships for graduate students, (2) fellowships are matched with grants to the institutions which these students attend, (3) Federal grants for research and development support additional numbers of graduate and post-graduate students, as well as professors in graduate departments, (4) specially earmarked grants and guaranteed loans are available for the construction of additional graduate facilities, (5) various agencies administer special aid programs to strengthen graduate schools.

Is There a Clearly Stated Federal Purpose for Graduate Student Support?—The objectives and the desirable levels of support for graduate education have not been stated precisely. In general, support for graduate education and research during the past decade has been justified by the drive for U.S. pre-eminence in the physical sciences. A later factor underlying the increasing support of graduate schools was the desire to improve the content and methodology of teaching in the humanities and in a number of professional disciplines, such as medicine. To a large extent, the support to graduate education was first motivated by U.S. competition with the USSR in science and engineering, and was extended to other fields to strengthen the posture of the universities.

The conventional approach to the support of graduate education is eloquently stated in a report to President Johnson, *Toward a Long-Range Plan for Federal Support for Higher Education* (U.S. Department of HEW, Office of the Assistant Secretary for Planning and Evaluation, January 1969):

> Graduate education is the culmination of the formal process of preparing individuals for teaching and for research and technical endeavor at the frontier of expanding knowledge and innovation. The graduate schools of the U.S. encompass a predominant portion of the intellectual forces that can assure the Nation of continuing capability to advance knowledge, to extend the base for technological progress, to influence the social, cultural, and economic quality of national life, and to exert intelligent and effective leadership in world affairs. Since the benefits from the acquisition of new knowledge accrue to all members of society, regardless of the State they live in, it is desirable that the Federal Government finance a much larger share of the costs of graduate education than it does in any other major sector of our educational system. For this reason Federal policy, especially in recent years, has recognized the need for a "special relationship" with graduate education and research.

There is an equally strong drive to increase all funds which benefit graduate education, including those for research and development. The Carnegie Commission on Higher Education recommended that research and development funds to universities be increased 15 percent a year.[1] This amount, the commission felt, would provide employment to all qualified graduates with advanced degrees. The argument is based upon an unstated assumption that the Federal Government is obliged to provide a level of support which will employ all qualified scientists, or that, conversely, the benefits of research transcend those which can be garnered from competing federally-sponsored programs. The implications of the Carnegie Commission proposal are staggering: the research and development share in the Gross National Product would double every ten years.

It is argued here that further support to graduate education and related research and development needs to be re-examined. The stakes are high: the Federal level of R & D in 1968 reached $17 billion a year,[2] of which close to $2.2 billion was spent by institutions of higher education. It is quite possible that in a post-industrial society a much larger share of the national product will be invested in improving future prospects, but it appears prudent to look also at alternative policies, which do not depend upon this higher rate of growth in research and development. If research and development expenditures grow no faster than Gross National Product in the long run, it is likely that the total demand for research personnel will increase only 5 or 6 percent a year, if overhead investment per researcher remains constant. If the support expenses increase faster than the Gross National Product, the demand for scientists may even stabilize or decline in absolute terms.

There has already been some evidence of a slow-down in the demand for scientists in several sectors in the economy. Between 1964 and 1968, for example, the proportion of scientists employed by business and industry declined, and the proportion of those in Government remained constant, according to the National Science Foundation's professional register. A large proportional increase in the employment of scientists took place in the education sector.[3] The U.S. Employment Service has also noted a softening in the demand for engineers in 1968.[4]

Employment opportunities for the products of our graduate schools will be concentrated increasingly in the educational sector. If this hypothesis is correct, the pattern of demand for persons with graduate degrees is likely to be affected quite drastically, since the proportion of physical scientists is much higher in the slow-growing sectors than in such fast-growing sectors as education. The ratio of physical scientists to humanists and, possibly, social scientists in post-secondary institutions may further decrease from present levels if the emphasis in post-secondary education shifts towards enrichment of the nonworking life.

Social Origins of Graduate Students.—Data in Section 3 indicated that persistence in post-secondary education is related both to high school achievement and to parental income. The higher the achievement, the greater the likelihood that the student will complete four years of education, and the same relationship holds true between income and graduation rates.

Since the high school records of less affluent students are less impressive than those of their more affluent peers, the proportion of college students who actually graduate is much lower for the poor than for the affluent. The differences in persistence according to social class are much narrower in graduate schools.

An interesting if somewhat equivocal measure of the social origins of graduate students is available from a sample survey of graduate students conducted by the Office of Education in the Spring of 1965. The survey reported the incomes of graduate students' fathers at the time of the students' high school graduation. According to this survey, 29 percent of graduate students came from families where the parental income was less than $5,000 a year, and an additional 27 percent stated that their parents' income was in the range of $5,000 to $7,499.[5]

It is difficult to relate these figures to income quartiles, since dates of high school graduation for graduate students vary from the 1950's for some doctoral candidates to 1964 for those who enrolled in graduate school directly after obtaining a B.A. However, an overall inspection of the data and a comparison with income distributions of undergraduates in the early 1960's gives the impression that children from poor families were over-represented in the graduate student population, as compared to undergraduates. This impression is borne out by comparing the educational attainment of parents (heads of household) of undergraduates in the Fall of 1966 with that of fathers and mothers of graduate students. As many as 41 percent of the fathers and 36 percent of the mothers of graduate students did not graduate from high school; for the heads of household of undergraduates, the figures was less than a third.[6]

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[1] *Quality and Equality: New Levels of Federal Responsibility for Higher Education,* Carnegie Commission on Higher Education, December, 1968, p. 40.

[2] *Special Analysis: Budget of the United States,* Fiscal Year 1970, Analyses Q and I, pp. 240 and 127. Note: Expenditures by educational institutions include $700,000 for research centers.

[3] *Reviews of Data on Science Resources,* National Science Foundation, Washington, D.C., 1964 and 1968.

[4] *The Job Market for Engineers, Scientists and Technicians,* U.S. Employment Service, Bureau of Employment Security, U.S. Department of Labor, July, 1968, p. 1.

[5] Hunter, J. Scott. *The Academic and Financial Status of Graduate Students, Spring 1965,* U.S. Department of Health, Education, and Welfare, Office of Education, Washington, D.C., 1967. See Table 1, page 7.

Another analysis of the social antecedents of graduate students in the mid-1960's can be taken from a survey of the college population made by U.S. Bureau of the Census as part of its current population survey sample.[7] The information presented by the survey distributes the students by income of their parents for those who are still part of their original household, and gives aggregate information for all students who live separately from their parents (see Table 7–1). Roughly two-thirds of graduate students are no longer part of the parental household. One-third are still part of their parental household, and of these one-half come from families with incomes over $10,000 a year.

TABLE 7–1.—*Family Status and Incomes of Graduate Students, 1967*

Student family status and income	Totals
Totals	100.0
Dependents	
Under $5,000	2.5
$5,000–$7,499	4.8
$7,500–$9,999	4.5
$10,000–$14,999	7.2
$15,000 and over	8.8
Non-dependents	
Married, spouse present	51.7
Other	20.4

Source: Unpublished tabulations from the U.S. Bureau of Census.

The typical graduate student lives on his own. In two cases out of three, he is married. Only the children of the well-to-do are still part of the parental household. Less than 7.5 percent of all graduate students who are still dependent on their parents are part of families with below median incomes. Another 20 percent are part of households where the income is above the national median.

Considerations in Setting Graduate Aid Levels.—Aid to graduate students must be viewed differently than aid to undergraduates. A person who already possesses a B.A. has the choice of earning a decent wage, rather than continuing in graduate school.[8] The majority of graduate students are on their own; a large number of them are being helped through graduate school by their spouses. Compassion has no place in determining the amount of Federal aid to this segment of the student body. The level of aid should be set in terms of equity and national policy. We need to ask questions such as these:

1. To what extent must we ask these young people to forego income during their graduate careers, given the types of jobs they will be asked to fill?
2. To what extent can we expect them to opt for graduate education in the absence of subsidies?
3. If they do not continue their studies, how important will the talent loss be to the Nation?

Good answers are not available to any of these questions. It would appear, though, that income increments are likely to narrow for persons with graduate degrees, compared to those with four years of college, as a greater proportion of graduates select teaching as a career in order to practice what they have learned. Unless the psychic returns from teaching are very high, this may discourage a number of able students from continuing their studies.

Sources of Graduate Student Financing.—It is argued here that a principal concern for the Federal policy planner at the outset of the 1970's should be to understand the various forms of graduate support, as well as its distribution among students in various disciplines. In this section the types of support are analyzed; the distribution of Federal support will be discussed in the following section.

Graduate student support comes from a variety of sources. Some of it is very straight-forward, through scholarships and fellowships financed by the Federal Government, institutions or business firms. Many graduate students support themselves by working as assistants on research and development projects financed, mostly, by Federal funds and teaching assistantships. A large number depend upon their own earnings to finance part-time attendance in schools, while others finance a graduate education wholly or partially by their spouse's earnings. It is difficult to isolate how each source of funds contributes to the financing of a graduate education. Most graduate students draw on more than one source.

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[6] *Idem*

[7] *Idem*

[8] Cf. *Students and Buildings, op. cit.*, Section 6.

Two publications[9] give an inkling of how all graduate students support themselves. Unfortunately, both are slightly out of date, since they fail to reflect the Veterans Administration's support to Vietnam war veterans, which became increasingly important in 1967 and 1968.

Of the two, the Office of Education publication is far more comprehensive. It provides information on source of funds by type of student (part time and full time), by total amount of income received by source, by discipline, etc.

The total cost of pursuing a graduate education is difficult to estimate, because so many of the graduate students attend part time. The median tuition and fees of full-time students in 1965 fell within the range of $600 and $799 a year, and the median living expenses were between $2,000 and $2,999. Hence, the median cost of attending graduate school was roughly $3,200 a year for full-time students. The mean expenditure, calculated in the Office of Education survey, was $3,700. Part-time students lived somewhat better, with median expenses in the range of $5,000 to $5,999. Here the mean of $4,000 is somewhat below the median.[10]

The Office of Education survey estimated that full-time graduate students spent $645 million in 1965. Roughly two-fifths of the funds came from government or institutional sources: fellowships, teaching assistantships, research assistantships and scholarships. Close to 3 percent came from loans, and the rest was financed through the student's or parent's resources. It is significant that roughly two-fifths of the financing came from the student's or his spouse's earnings (split nearly evenly between the students and their spouses), and that parental contributions did not amount to much more than one-twelfth of the funds expended by graduate students.

Part-time students reported spending close to a billion dollars a year. A little more than four-fifths of that amount came from the student's or spouse's earnings. Most of the rest came from institutional assistance; about one-fifteenth of the money came from other sources, such as savings, family contributions, etc.

The variety of sources of student support leads inescapably to the conclusion that Federal Government scholarship and fellowship support plays an important, but not dominating, part in student financing. Fellowships and scholarships accounted for a little less than a quarter of the total financing of full-time graduate students. Teaching assistantships and research assistantships played an equally important role. Thus, (1) the Federal role in encouraging undergraduate attendance at colleges and universities, which creates a demand for many teaching assistants, and (2) Federal interest in research and development, which produces much of the funds for research assistantships, are just as important as (3) the Federal support of scholarships and fellowships. It is significant that roughly twice as many stipends were awarded by institutions as by the Federal Government in 1965.

Total Federal Aid to Graduate Students.—Total aid to graduate students in fiscal 1968 was budgeted at $475 million. (See Table 7–2). Of this amount, $85 million came from loans, $104 million from research assistantships, and $286 million from stipends and fellowships. Compared to 1967, $67 million more was available for graduate student support: $23 million came from loans, $31 million from stipends, and $13 million from research assistantships. The bulk of the increase in stipends and fellowships was due to an $18 million increase in V.A. payments.

Current projections, based on budget requests to the Congress, estimate that by 1970 total aid to graduate students will amount to $572 million—an increase of $97 million over 1968. Whether this estimate is correct will depend on the rate of lending, since loans will account for $48 million, almost half the total increase. Stipends are budgeted for a net increase of $44 million: $36 million from V.A. payments, $22 million from OE programs, and $2 million from other agencies, offset by decreases of $8 million in NASA, $5 million in NSF, and $3 million in PHS funds.

Different agencies place different emphasis upon support of students by discipline. Quite naturally, the National Science Foundation, the National Aeronautics and Space Administration, and the

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[9] Hunter, J. Scott, *loc. cit.*, and National Science Foundation, Office of Planning and Policy Studies, *Graduate Student Support and Manpower Resources in Graduate Science Education*, Fall 1965, Fall 1966, Washington, 1968.

[10] Hunter, J. Scott, *op. cit.*, Tables 8–11.

TABLE 7–2.—*Federal support for graduate students, estimates by agency: 1966–67 to 1969–70*

(Amounts in millions)

Agency	FY 1967	FY 1968	FY 1969	FY 1970
Total federal student aid	408.6	475.4	524.1	572.4
Graduate student stipends [1]	346.0	390.2	409.5	439.2
Department of HEW	201.5	217.7	223.2	242.7
Office of Education	100.7	108.9	116.5	132.5
Public Health Service	87.4	92.2	88.8	91.1
Other	13.4	16.6	18.0	19.1
Veterans Administration	46.4	64.8	90.3	101.0
National Science Foundation	44.2	48.2	43.6	44.2
Department of Defense	17.5	20.1	19.3	20.6
Atomic Energy Commission	7.7	8.6	8.0	8.4
National Aeronautics & Space Administration	19.2	19.5	14.0	10.6
Department of Interior	1.9	2.2	2.1	2.2
Other Agencies	7.5	9.2	9.0	9.6
Loans [2]	62.6	85.2	114.6	133.1
Department of HEW, Office of Education	62.6	85.2	114.6	133.1
Direct loans	33.6	35.4	40.2	40.2
Insured loans	29.0	49.7	74.4	92.9

Note: Details may not add to totals because of rounding.

[1] Estimates for predoctoral academic year programs. Amounts are for student support only (stipends and other allowances) and include estimates for payments to graduate research assistants. First professional degree medical students aid programs are excluded.

[2] Funds include both Federal program funds and other funds loaned to students insured by or guaranteed by Federal funds.

Source: *U.S. Budget* and agency budget justifications, Federal Interagency Committee on Education published and unpublished materials, and OPPE estimates.

Atomic Energy Commission primarily support graduate students in the physical sciences, with the first two agencies alloting 10 and 5 percent of total stipends respectively, to students in the social sciences. In the Department of Health, Education, and Welfare, outside of the Office of Education, roughly 87 percent of the grants to graduate students were in mathematics, physical and medical sciences. The social sciences ran a poor second with some 10 percent of the grants. Within the Office of Education, a little less than one-third of the graduate students supported were in the field of education, and another quarter in the arts and humanities. Nearly 40 percent of the grants went to students in science fields, including the social sciences, which alone claimed close to 20 percent of the total grants. (See Appendix Table 7–1). For the non-V.A. sector, in 1968, 31 percent of the fellowships went to graduate students in the hard sciences, 23 percent to social scientists, 10 percent to students in the humanities, and 15 percent to education majors.

It is interesting to compare these distributions with the free choices made by students supported by the Veterans' Administration. Twenty-seven percent of these chose education as a field of graduate study; 13 percent, arts and humanities; 16 percent, social sciences; and only 21 percent chose hard science or engineering fields.

The role of the Veterans Administration in financing graduate education, together with the more important role of the Office of Education in distributing graduate student aid, is altering the effects of the Federal Government's contribution to graduate education. Between 1965 and 1968, the share of Federal scholarships that went to graduate students in the humanities increased from 4 to 10 percent. (See Appendix Table 7–2.)

The agencies which traditionally supported education at the graduate level were the National Science Foundation, the National Institute of Health, the Public Health Service, the Atomic Energy Commission and the National Aeronautic and Space Administration. Most of these agencies channel their support to graduate disciplines in the sciences. They have been fairly successful in obtaining a sufficient volume of funds to support the majority of students in the physical sciences. Thus, 85 percent of the doctoral candidates in physics, chemistry, and atmospherics, and two-thirds of the doctoral students in biochemistry received some Federal support. Part of the largesse extended to students in the social sciences, with doctoral candidates in some specialties like economics achieving close to 50 percent support from Federal sources. By contrast, the proportion of doctoral candidates receiving support was as low as 20 percent in some of the "soft" sciences, such as political science and the humanities.[11] (See Appendix Table 7–3).

The allocation of Federal aid in the field of science has had some beneficial effects: In the mid-1960's, 62 percent of graduate students started work in graduate school immediately after their baccalaureate, as compared to 38 percent of students in education. Yet in some lightly supported disciplines, such as the humanities and social sciences, 60 percent of all graduate students went into graduate school the year after their baccalaureate. Earlier enrollment generally results in smaller attrition rates, and in some specialities, it produces a higher orientation towards research in later life.[12]

It does not appear that the extent of financial support available in a specific academic specialty has induced more students to choose a graduate career in that specialty. The percentage increase in Ph.D.'s granted between 1961 and 1967 bears very little relationship to the percentage of Ph.D. students supported. It can be inferred that support was available to most deserving students in the physical sciences. Students in the humanities and the non-physical sciences appear to have found elsewhere the where-with-all to complete their degrees.[13]

While the quality of graduate students, as measured by their undergraduate grades, varies quite drastically from discipline to discipline, the amount of available aid varied even more in the mid-1960's. In education, for instance, only 10 percent of the graduate students had earned A's as undergraduates; in the professional disciplines 13 percent of graduate students had the same record; by contrast, in the behavioral sciences 18 percent had an A record; so did 23 percent of graduate students in the physical sciences. In 1965, there were 2.2 stipends per A student in education, 1.8 stipends for every A student in the humanities, 2.8 in the professional fields and social sciences, and 2.9 in science. If both A and B students are added together there were .4 stipends per student in education, .6 per student in the humanities, .9 in the social and behavioral sciences, .7 in the professional fields and .9 in science. From these figures, it follows that some redistribution of stipends to education and the humanities might have been desirable during that year.

The average grant to graduate students in most disciplines ranged between $2,600 and $4,800, clustering close to $3,300 on the average in the case of non-V.A. aid. The Veterans Administration provided roughly $2,000 per student aided. (See Appendix Tables 7–4 and 7–5).

In disciplines where a large number of students were supported, such as physical sciences and math, the average stipend is relatively low. It increases in some disciplines where the proportion of students supported was much less, e.g. the social sciences and education. While the average level of support was roughly $3,000 in the former disciplines, it was $3,700 in latter ones. The reason for this apparent contradiction is that doctoral students, supported more generously, are likely to constitute a greater proportion of stipend holders in disciplines where stipends are few.

An equity question must be raised again: Is it fair to subsidize students in physics more often than students in modern languages? The answer should not lie in an unstated preference for "hard" over "soft" disciplines. It is quite possible that the students know where the demand for their services is likely to be. The allocation of resources need not be left to the special pleading of various agencies. It may be fairer to subsidize all students of promise, irrespective of discipline.

The Impact of Graduate Instruction on Institutional Costs.—The expanded support to graduate students, and the consequent increase in graduate enrollments, have had a profound impact on the financial conditions of institutions that cater to graduate students. Even though graduate enrollments increased only from 10 percent of the total degree credit enrollment to 11 percent of the total enrollment in 1968, this increase was strongly felt in the relatively few four-year institutions that have graduate departments.

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[11] *Graduate Student Support, loc. cit.*

[12] Cf. Hunter *op. cit.*, Table 13 with Table 23.

[13] Cf. American Council on Education, *A Fact Book on Higher Education*, Washington, D.C., 1968, with *Graduate Student Support, loc. cit.*

There is considerable agreement that graduate students cost a great deal more to educate than undergraduates. Not only are graduate classes smaller, but professors who offer instruction at the graduate level have lighter class schedules. In addition, it is generally believed that graduate instruction, especially in the physical sciences, requires a considerable amount of fixed investment in facilities and equipment by the university.

While we have no information on this latter point, the data collected by the Oklahoma State System[14] for the academic year 1965-66 gives some inkling of the differences in instructional cost per student credit-hour for graduates and undergraduates.

For the Oklahoma system as a whole, graduate courses were roughly four times as expensive as all undergraduate courses. The graduate science courses cost roughly 50 percent more per student credit-hour than the graduate non-science courses. The variation in costs by school is impressive indeed. For the two largest schools which offer the bulk of graduate science instruction, Oklahoma University and Oklahoma State University, the outlays of instruction were between $55 and $60 per student credit-hour. The graduate non-science courses cost $32 in Oklahoma University and $62 an hour at Oklahoma State University. By contrast, some of the smaller schools like Northeast State College expended only $9 per student credit-hour in graduate non-science courses. Differences in course mix within broad disciplined areas do not go very far in explaining such variations in cost.

At Oklahoma State University the graduate non-science courses cost 50 percent more than they would have cost at Oklahoma University. By contrast, in the seven small schools which offer graduate non-science courses, the expenditures were very much below the costs incurred at Oklahoma University. In the third largest school, for example, the actual cost incurred was $28. Had the courses been given at Oklahoma University, they would have cost $41 per student credit-hour.

The most important implication of these comparisons is that the smaller schools had apparently lower costs and offered presumably lower quality programs. In the field of graduate science, very few credit-hours of work were offered by the smaller schools. The costs incurred for these courses were also very much lower than those of larger schools with more voluminous programs.

The impact of the expansion of graduate instruction on college finances was discussed in more detail in Section 4, which examined the financial conditions of institutions. Some implications of this discussion should be related to the problem of financing the graduate student sector:

1. Graduate instruction is generally offered in institutions which have higher cost per student than the average.
2. Graduate instruction appears to be considerably more expensive than undergraduate instruction, and is an important factor in the larger-than-average increase in cost of prestige institutions.
3. If the Oklahoma system is typical, small institutions which enroll graduate students showed a smaller increase in per student cost than did large institutions.

To summarize the cost analyses of various institutions, the emphasis on graduate instruction has been a principal cause for the hard financial conditions of larger colleges and universities.

In this connection, it would be useful to look at the current policies of the Federal Government in subsidizing institutions in the area of graduate studies. The most direct subsidy is the matching grant which institutions receive for every graduate student supported by a Federal scholarship. The estimated amount of these grants is $162 million in 1968 (see Table 7–3). The grants average $2,500 per student on a fellowship and vary slightly according to discipline. These reimbursements do not begin to pay back the institutions for the out-of-pocket expenses incurred in connection with the instruction of graduate students—expenses which may be estimated at close to $2.5 billion. Our estimated cost per student amounted to $5,000 for 1965-66. These estimates were made on the basis of the average costs incurred by private universities per equivalent student, a hybrid which consists of weighing all undergraduate students at the weight of one, and all graduate students at a weight of three. It would appear that publicly controlled universities must spend close to $4,000 per graduate student, on the average and privately controlled universities close to $6,000 per graduate student. If one esti-

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[14] Coffelt, John J. *Faculty Teaching Loads and Student Credit-Hour Costs: Oklahoma State System for Higher Education*, Oklahoma State Regents for Higher Education, 1964 and 1968.

TABLE 7–3.—*Institutional Support From Federal Graduate Student Support Programs: FY 1968*[1]

(Amounts in thousands)

Agency	Amount
Total	$162,056
Atomic Energy Commission	1,305
Dept. of Health, Education, & Welfare	......
Public Health Service	54,738
Office of Education	61,897
Other	11,362
National Aeronautics and Space Administration	8,517
National Science Foundation	22,763
Other Agencies	1,474

[1] Amounts include cost of education payments associated with fellowship and traineeship programs and institutional costs associated with training grants.

Source: U.S. Budget and agency budget justifications.

mates an additional $200 million as tuition receipts, the deficit is still quite sizable, on the order of $2 billion. Thus, the graduate students, who number slightly over 10 percent of the enrollment, are probably responsible for 40 percent of the institutional instructional deficit.

It should be noted that those institutions which employ a large number of students as graduate assistants or as research assistants on government-sponsored research and development projects do not receive any subsidy from the Federal Government to cover the instructional cost of these individuals. If it is reasonable to assume that a research and teaching environment contributes to the effectiveness of the graduate school experience, it may be more reasonable to subsidize all graduate students than to limit such subsidies to those who benefit from Federal scholarships. Recognition is overdue of the indirect effects of other Federal programs, such as:

(a) Additional undergraduate students who swell undergraduate enrollment,

(b) Research and development expenditures which not only give an opportunity for, but also require the use of young research assistants. They have an equally important effect upon graduate student enrollments as does the direct scholarship aid.

It may be well to work out a new formula for the support of graduate education which will take into consideration all these factors. Perhaps a formula could be developed to provide support to graduate schools in connection with the award of R & D contracts as well as scholarships. If the 1965 experience is any guide, 40 graduate students were employed for every million dollars of Federal R & D expenditures channeled to the universities. Perhaps a matching grant that recognized the swelling of graduate school enrollments by this number could be given to universities receiving R & D contracts to offset their expenses in this connection.

The Role of the Graduate School in the University.—A number of institutions have used the opportunity of establishing a graduate school as a way of upgrading the quality of their post-secondary offerings. Schools which offer graduate courses are known as universities, a word which has a better ring than a college. Administrators have reasonably argued that the existence of a graduate school makes it possible to attract scholars or persons pre-eminent in their field to an institution. A number of institutions have upgraded themselves and achieved prominence through this route, notably Michigan State University and Southern Illinois University.

Recently certain reservations have been voiced about this trend notably by Jencks and Reisman,[15] who suggest that the objectives of graduate departments have overshadowed the functions of the undergraduate divisions. These two authors advance the proposition that in many instances the university has become a self-generating mechanism for producing specialists who continue to work in other universities. They claim that the emphasis on narrow expertise, which often passes for scholarship in graduate schools, has been shown to have an adverse effect on the calibre of teachers at the undergraduate level. They point out that a number of experimental institutions which pioneered new undergraduate programs have since retreated to more conventional offerings under the pressure of graduate departments. As Jencks and Reisman put it, graduate departments have often looked down on successful and charismatic teachers as unrigorous mountebanks and have preferred to have them replaced by uninspiring but sound disciples trained in the narrow discipline of a given graduate department. If these charges are true, a re-examination of the role of graduate departments is in order.

If our projections are correct, a large number of persons with advanced degrees will find employment as teachers of undergraduates. Another significant number will become generalists, finding their employment in the industrial sector. The difficult balance between combining rigorous training and a broad understanding of social issues cannot be legislated by Federal statute. On the other hand, Federal efforts to encourage internship programs in undergraduate teaching for graduate students do deserve some attention.

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[15] Jencks, Christopher and David Reisman. *The Academic Revolution*, Doubleday and Co., Inc., Garden City, N.Y., 1968. See Chapter XII *passim*.

A much more serious issue is the proliferation of graduate school education. As late as 1965-66, less than 8 percent of all post-secondary institutions, 200 in number, granted 92 percent of the doctorates awarded in science. The same institutions conferred 72 percent of all master's degrees in science disciplines as well. Each institution, on the average, offered 12 graduate programs. To what extent the number of institutions should be increased is not at all clear.

A number of schools which started new graduate departments or tried to strengthen the existing graduate departments have discovered, unhappily, the high cost of this type of operation. In order to attract a prominent scholar into a not-too-well established institution, he had to be paid a high salary and promised a light teaching load, sometimes as low as one course per year. In the case of those departments which started graduate courses in the sciences, the overhead cost of the complex laboratories in the physical sciences came as an unpleasant shock to the institution. Even in the social sciences and humanities, the use of the computer as a research tool has driven the cost of graduate instruction beyond the wildest imagination of the early 1950's.

Really first-class talent is scarce. The competition from a large number of locations serves to disperse that talent in such a way as to make it less effective. The scholar does not benefit from the stimulation of his peers any more, and the graduate student does not receive a well-rounded education because certain requisite areas of expertise are not well-staffed.

The ambivalence in the standards of support to institutions is illustrated by the allocation of grants and loans for graduate school construction between 1965-68. Using the Nash and Nash index of institutional quality (which roughly approximates the financial strength of the institutions since it is based on such factors as expenditure per student, faculty-student ratios, percentage of Ph.D.'s on the faculty, and number of books in the library), roughly 40 percent of the grants went to extremely strong universities. Another 35 percent went to second-ranking universities, with roughly one-fifth devolving to weaker institutions.

Conclusions.—After examining the trends in graduate student enrollment and financing, one cannot but be impressed by how well the affluent American society can cater to desires of persons for graduate education. It does so far better than in the case of undergraduate education. It is our impression that the majority of students who desire to continue in graduate school find the means to do so. Some get support from the Federal Government or an institution. Others are self-supporting or are financed by their spouses.

There is some concern about the possible development of an over-supply of persons with advanced degrees, especially in the physical sciences. Yet our studies have indicated that a recommendation to cut the support for students in these disciplines would probably not reduce the number of graduate students. As James Davis has found,[16] people do not change their major in graduate school in response to the availability or lack of availability of funds. Fortunately, the balance in the availability of funds has moved from the science-oriented agency to agencies which are oriented to a broader spectrum of students. The pattern of fellowship grants by the Office of Education and the Veterans Administration seems to be more closely related to the pattern of demand for graduate education of all students than does the grants of AEC, NSF, and NASA.

The important role played by the V.A. in graduate student financing should be watched closely by planners interested in Federal policy on graduate students. Hopefully, the war in Vietnam will not last forever, and the role of the V.A. in graduate student support will gradually decline a year or two after the end of the hostilities. However, under these circumstances, non-V.A. funds to support graduate students will have to be increased, preferably on a more catholic basis.

Our basic optimism about the financing of graduate students does not extend to the effect of graduate education upon institutional finances. The concern is twofold. In the first place, graduate education accounts for the disproportionate deficit in the post-secondary sector. In the second place, there are some indications that the proliferation of graduate education to weaker schools has not been matched with commensurate increases in the quality of the courses offered to graduate students. It has been indicated that a Federal policy for graduate education should be evolved. If attention is paid to regionalism, a small number of weaker schools should be strengthened with large infusions of money. Only a limited number of schools should be supported to provide graduate education. The rest of the schools, it has been felt, do not deserve Federal support. There is some merit to this hard-nosed policy and it should be examined more closely.

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[16] Davis, James A., *Stipends and Spouses: The Finances of American Arts and Science Graduate Students*, Chicago, University of Chicago Press, 1962.

Graduate education has been a booming establishment with rising expectations about the volume of jobs, the pattern of promotions, and the grandeur of research establishments. The slowing down of the rate of change is considered threatening. This is why the military draft caused such anxiety in the graduate schools. They were afraid that the overhead which they had already acquired and the professors who had been earmarked to train graduate students, would be spread over fewer students, and would cause them to increase their losses.

Also, to mention the unmentionable, most institutions use their graduate students as cheap labor in teaching undergraduates. Therefore, the draft could well have increased the cost of undergraduate instruction.

The practice of assigning graduate students to teach undergraduates should be reviewed. Young assistants are not trained to become effective teachers at the post-secondary level. Most are allowed to sink or swim on their own in large classes of unruly undergraduates.

It would be desirable to assert Federal pressure in connection with stipends, fellowships and other types of support of graduate schools to change the present practice. Universities must be encouraged to provide supervision and training for inexperienced teachers of undergraduates, especially the graduate assistants. If more aid is given to graduate schools, we would certainly advocate that some of it be tied to practice teaching, supervision, and development of programs to increase the effectiveness of undergraduate teaching.

8. Forms of General Aid to Institutions of Higher Education

Two general approaches have been developed to provide financial aid to institutions of higher education. The first, which is in current use, consists of categorical aid. Grants are available to institutions of higher education for special purposes: e.g., to pay for a portion of construction outlays, purchase certain types of equipment and materials, or undertake specified activities such as courses in urban affairs. Interest subsidies and Federal guarantees of the principal borrowed for construction also are available to higher education institutions. Additionally, institutions may receive a matching grant for each student enrolled under a Federal scholarship program.

The other approach, general aid, proposes unrestricted grants to institutions of higher education based upon some institutional criteria, such as a percentage of expenses, or the number of students receiving instruction. Such grants, it is argued, make it possible for the institution to determine its most pressing needs by itself and apply the Federal subsidy either to meet instructional costs or finance additions to plant, as the need may be.

These proposals are being advanced because it is claimed that current Federal categorical aid programs may distort the allocation of post-secondary resources. The categorical programs with the most funding, those which subsidize construction, may have diverted funds from the improvement of instructional capability. This argument appears to have some merit, since the utilization of facilities in higher education is much less intensive than that in secondary educational institutions having comparable student loads. Furthermore, it has been found that the utilization of facilities at a number of institutions which have been eligible for aid is much lower than in neighboring institutions of comparable quality which did not choose to apply for construction grants. In several other programs, such as subsidies for the acquisition of library books and materials, the amounts allocated are so small (they amount to $5,000 for the average institution), that they are not likely to have much effect upon the quality of the library. Critics argue that an institution which requires that small amount to improve its collection does not deserve to remain in the fold of accredited post-secondary institutions.

Another significant problem with categorical grants is the accountability burden. College administrators have complained about the many layers of institutional, State, and Federal bureaucracies which have been created to administer and keep track of these grants. These attempts to control the application of funds appear even more ridiculous because, in many instances, there is no provision to prevent substitution of internal resources for different purposes. A cursory analysis of the effects of past Federal grants indicates that generally no substitution can be proved (or disproved). But this does not guarantee that substitution may not occur in the future. It only indicates that the intent of Congress and that of college administrators seems to have corresponded so far.

The great operational advantage of categorical grants over general grants is that their use has circumvented the church-State issue in higher education, where church-related institutions play such an important role. By stipulating that facilities built with Federal funds cannot be used for religious instruction, it has been possible to avoid the political implications of aid to church-connected institutions.

General aid to institutions of higher education, either in addition to or as a supplement to categorical aid, must meet certain criteria consonant with Federal objectives in higher education. These are:

- Promotion of greater equality of opportunity.
- Achievement of excellence and growth of quality instruction.

In addition, there are several desirable conditions which must be met to insure that these objectives are not compromised. These include:

- Drawing forth rather than replacing State and private support.
- Assisting both public and private institutions.
- Preserving institutional autonomy.
- Encouraging diversity.
- Inviting innovation and the conservation of resources.

- Minimizing administrative complexity.
- Enhancing the ability of institutions to respond to changing social needs.

The merit of both general or categorical aid proposals to institutions of higher education must be evaluated as to how well they meet the above objectives and conditions. There are a number of general administrative considerations which must also be kept in mind. Can eligibility by institution be determined easily without placing an undue burden on the management of the institution? Is the aid likely to be distributed equally among regions and different institutional types? (This may be only a political virtue.) Is it likely to provide desirable benefits to the different branches of study offered by post-secondary institutions? In addition, some attention must be paid to the implied commitment of the Federal Government to fund the program.

Hence, the acceptability of an aid program must be evaluated in terms of:

- Its administrative burdens,
- Its adequacy to meet the needs of: (a) regions, (b) institutions, and (c) disciplines, and
- The flexibility which it affords to Congress to set the level of financing in a given year.

A variety of aid measures have been suggested. They include providing aid to institutions proportional to:

- The annual dollar amount received in the form of Federal research awards in science.
- Student credit hours in science.
- Earned doctor's and master's degrees in sciences during the preceding three years.
- The change in educational expenditures at each institution from some base period.
- The change in educational expenditures per student from some base period.
- The change in student hours of instruction from some base period.
- The number of student hours of instruction at each level of instruction
- The number of degrees awarded annually at each level of instruction.
- The amount of Federal student undergraduate aid given to students attending an institution.
- Institutional instructional costs and ability of students to pay for their education.

At least five proposals for general formula grants to institutions have been widely discussed.[1] These are:

1. The Miller Bill (H.R. 875, 90th Congress).
2. A growth formula suggested by Howard R. Bowen.
3. An adaptation of the per capita grant for degrees awarded suggested by the Select Committee on the Future of Private and Independent Higher Education in New York State.
4. A formula known as the Basic Enrollment Formula proposed as the result of a series of meetings between representatives of the U.S. Office of Education and several associations of institutions.
5. A method known as the Farrell-Anderson Growth Difference Formula.

Each of these proposals is examined below as well as the more recent proposal by the Carnegie Commission for Higher Education and a proposal presented for purposes of discussion by this Office.

The Miller Bill.[2]—The Miller Bill would authorize $400 million to be distributed by the National Science Foundation to institutions on three bases:

1. One-third of the amount authorized would be distributed to institutions as a graduated proportion of the total amount of money received by each institution in the form of Federal project awards during the prior year. Each institution would receive at least 100 percent of the first $50,000 of their project grants, and a graduated percent for the project grants after the first $50,000.
2. An additional one-third of the amount authorized would be allocated to States in proportion to the number of full-time equivalent undergraduate students and subsequently distributed to each institution within a State according to: (a) the number of student credit hours taught in the sciences at each institution;[3] (b) the number of baccalaureate degrees awarded in the sciences; and (c) the relative costs of lower and upper division instruction. Certain other factors such as the amount of non-Federal student aid offered could be considered

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[1] They are summarized in the American Council on Education, *General Federal Support for Higher Education: An Analysis of Five Formulas*, August 1968, Washington, D.C., to which the following descriptions owe a great deal.

[2] The information below is based on the revised Miller Bill.

[3] Biological, medicine, and physical sciences; mathematics, engineering, and social sciences; and programs designed for the preparation of teachers in such fields.

as alternative criteria for distributing the funds among institutions within a State.

3. The remaining one-third of the amount authorized would be distributed to each institution in proportion to the number of earned master's and doctor's degrees in science during the prior three years at each institution. Consideration would be given in the distribution of funds to relative costs of master's level degrees as compared to doctor's level degrees.

Thus, in distributing the total amount of funds available, the Miller Bill would give equal weight to the conduct of research and development projects in science, to instruction in the sciences, and to the production of advanced degrees in science.

The implied purposes of the formula are to reimburse institutions for research and development and for instruction at both graduate and undergraduate levels in the sciences. The definition of science as stated in the proposal is very broad. It would seem to include all fields in the biological, physical, and social sciences.

The underlying rationale of this legislation is threefold. First, quality institutions which successfully compete for government awards in science should be rewarded with an override to cover the costs not generally met through government reimbursement. Second, there is concern that insufficient attention is being paid to the field of science in the light of the needs of the U.S. national security and general economic growth. Third, there is recognition that most instruction in the sciences is more costly than that in the humanities; and that a subsidy for this purpose will tend to equalize the financial pressures between institutions which are heavily oriented to the humanities and those which specialize in science.

It is these last two objectives which make the proposal somewhat less effective than it ought to be. Variations in the cost of instruction in different branches of science such as biology, physics, chemistry, or social sciences are quite wide. The Bill does not provide a mechanism for accommodating to these differences in cost, and hence the Miller Bill could tempt institutions to increase their offerings of less costly disciplines and lower-level undergraduate courses at the expense of more costly or higher-level courses. This is clearly not the intent of the Bill. The allocation procedures are likely, as presently stated, to cause other imbalances. For example, 200 institutions out of over 2,400 account for over 90 percent of the doctorates in science and close to 80 percent of the master's degrees; consequently, benefits of this part of the Bill would be restricted to a relatively small number of institutions.

The most promising feature of the Miller Bill is its provision of an "override" to quality institutions. There is general recognition that Federal research does not fully pay for the overhead. Thus, subsidies to quality institutions have some attraction. Unfortunately, the procedures for distributing aid would tend to discriminate against institutions doing basic research in non-Federal fields, or those heavily oriented to humanities. While these provisions may cause reduction in the cost for science research and may cause institutions to bid more enthusiastically for science contracts, it may well result in increases in the cost of other types of research.

The Bowen Growth Formula.—Howard R. Bowen has suggested a system of grants based upon some fixed proportion, such as one-half, of the annual increase of an institution's cost for instructional purposes. Some variations of this proposal would limit the difference between schools or put a ceiling upon the instructional expenditure per student which is to be reimbursed.

The intent of the Bowen Formula is to develop a method to subsidize post-secondary institutions, taking into account (a) changes in per student cost and (b) differential rates of growth in enrollment.

In its simplest version, the formula would reimburse some portion of the increase in the total cost. Given equal rates of growth in enrollments, this version would benefit institutions which have the highest increases in cost per student and which continue to increase these costs at an average rate, or those where the costs increased per student at a rapid rate. For two institutions with identical costs per student and identical rates of increase in costs, the largest benefits would accrue to the institution which grew fastest.

This version of the Formula was criticized because an unlimited ceiling on the reimbursable amount for expenditure increase would encourage the more profligate institutions which do not exercise tight control over their costs. If the reimbursement is only a fraction of the increase in cost, this criticism is much less valid than if a major part of the cost increase is reimbursed. Similarly, some reservations have been voiced about institutions which allow the quality of their instruction to be watered down to encourage growth.

They could be rewarded generously under the Bowen Formula.

To meet the criticism, it has been suggested that reimbursement should be limited, using as a standard the mean expenditure per student at each level of instruction for all institutions of a given type and control. In effect, all liberal arts colleges would be reimbursed at a given rate.

A third variation would go even further and would use national mean expenditures per student as a standard for reimbursement. Still another proposed variation assigns different weights to increases in enrollment in such a way as to reward the institutions at different marginal rates for increased services.

These modifications, even though they seem to encourage parsimony, may have undesirable side effects. They would favor those institutions with expenditures below the average and work to the disadvantage of those institutions with expenditures above that level. The effect of these modifications would probably be to equalize expenditures per student by retarding the growth of high-cost institutions. In effect, reimbursements would become proportional to the rate of growth in enrollment. Thus institutions with high prestige, and usually high expenditures, would not benefit as much as those which deal with a less affluent clientele and have lesser reputations.

The Bowen proposal illustrates the difficulty of meeting criteria for both equity—that is, setting the amount to be reimbursed at a level proportionate to the increase in outlays—and for promoting institutional efficiency. The first version of the Bowen proposal would set the grants at some proportion of the actual institutional cost; the second would prompt the setting of incentives on a per student basis with the more parsimonious institutions reaping the greatest advantage.

It is difficult to favor one version of the proposal over another. If one had some confidence in the way the post-secondary system operates, one would like to encourage those institutions which offer superior instruction to grow faster than those which do not. If these institutions also happen to have above-average costs, their growth would be facilitated. By contrast, if institutions can offer superior instruction at or below average cost, the latter variance of the formula would tend to help their expansion. However, since most prestige institutions do in fact have high costs, the modifications of the Bowen formula would discourage their expansion. Post-secondary students would increasingly find places at lesser institutions with low costs which would be encouraged to expand, and the overall academic level of post-secondary education could easily be depressed. This eventuality is most likely to occur when the demand for post-secondary education is fixed and is being met through a screening device where the best students go to the most attractive institutions and the less capable students go to those which are less desirable. Since so many of the less capable students are likely to come from families with modest backgrounds, it is quite likely that any formula that sets the reimbursement at a figure equal to the mean expenditure per student in the Nation is likely to favor institutions which deal with the poor (and less capable) at the expense of the more affluent.

The determination of mean instructional expenditure per student is not an easy task. It requires the adoption of uniform accounting for all schools. Even under some simplified version where capital expenditures are included, some of the instructional costs and the allocation of instructional personnel time between research and teaching would still result in controversy.

Another feature of the Bowen Formula is likely to make it unacceptable to Congress. The Formula is cumulative after a base period has been established and a benefit to each school has been set. Next year's increases in cost and enrollments have to be added to this year's Federal appropriation. Hence, the amount of money to be allocated would depend very much upon developments in costs and enrollments, robbing Congress of discretionary power in setting a given level to the appropriation.

The New York State Formula.—The Select Committee on the Future of Private and Independent Higher Education in New York State recommended institutional grants of $400 for each bachelor's degree, $400 for each master's degree, and $2,400 for each doctorate granted. Whatever the amount per degree, the Committee recommended that the amount awarded for doctor's degrees be six times the amount awarded for bachelor's or master's degrees.

It has been suggested that by adding a grant of $50 per full-time equivalent student at junior colleges, and making both public and private institutions eligible for the grant, such a system could be adopted by the Federal Government.

This proposal does not differ in kind from those parts of the Miller Bill which would allocate a fixed total sum to institutions in proportion to advanced degrees awarded in the sciences and student hours of instruction in science. The essential differences are in the choice of the measures used—i.e., undergraduate degrees are used as opposed to student hours of instruction at four-year institutions and universities, the weights assigned to degree levels differ, the amount of an institution's grant is calculated at a fixed pre-determined rate per degree rather than by holding the total amount to be allocated constant; and all types of instruction or degrees (except possibly theological) are included.

Reimbursements based on a flat figure per degree fail to recognize the vast differences in the costs of the instructional products which exist between institutions of the same size or the differences in the costs of degrees by discipline. Both, the Miller Bill and this proposal, are arbitrary in dealing with the differences in cost by level of instruction.

The New York proposal does have the advantage of administrative simplicity and would offer an incentive to increase degree output. The proposal would, however, offer an incentive to reduce degree standards. It would also treat different types of institutions capriciously. The ratio of degrees awarded annually to student hours of instruction differs between institutions. Thus, it makes an important difference to the institutions involved whether hours of instruction or number of degrees awarded is used in allocating grants. The institution with a policy of relatively low entrance requirements combined with high degree standards would be at a disadvantage under a system which used degrees awarded as an allocation measure rather than hours of instruction. Hence, this proposal would encourage raising entrance requirements.

The Basic Enrollment Formula.—The Basic Enrollment Formula was worked out during a series of meetings between representatives of the U.S. Office of Education and several educational associations during late 1967 and early 1968. The simplest alternative would allocate to each institution a sum proportional to a weighted measure of enrollment. The weight would be derived by summing the product of full-time equivalent enrollment by level of instruction, with the lower-division undergraduate level receiving a weight of one, the upper division a weight of two, and graduate enrollment a weight of three.

A second alternative would first divide the total appropriation in any year into three parts in proportion to aggregate FTE enrollment at each of the three levels for all institutions after weighting as before. Each of the three parts of the total appropriation would then be distributed to institutions according to three respective measures. The lower-division share would be awarded to institutions in proportion to FTE enrollment at that level. The upper-division share would be allocated in proportion to the combined number of master's and doctor's degrees awarded.

A third alternative would retain FTE enrollment at the upper-division level as the allocation measure, using degrees awarded only at the graduate level.

The Formula also proposed that each institution receive a minimum annual grant of $15,000. With 2,500 eligible institutions, this would require at least $37.5 million per year in addition to any amount otherwise allocated according to the Formula.

The use of student hours of instruction or its equivalent, FTE enrollment, has advantages over the use of degrees awarded as an allocation measure However, the weighting of lower division, upper division, and graduate instruction remains arbitrary. It is doubtful that weights of one, two, and three carry much reality as measures of either relative cost or relative social benefit, expecially if disciplines are ignored. In addition, unless the Federal Government makes a prior commitment about the per capita dollars to be allocated, advanced planning by individual institutions would be nearly impossible, but, if such commitment were made, it would tend to have these funds substitute for other sources of revenue.

Farrell-Anderson Growth Difference Formula.—This Formula proposes a method to determine the annual level of Federal appropriations for higher education, and provides incentives for institutions to continue or increase efforts to find other sources of funds.

The level of funding would be determined for all four-year institutions and all two-year institutions separately. Once determined, funds would be divided between public and private four-year degree granting institutions on the basis of the annual aggregate number of degrees granted by each sector. Within each sector the public and private shares would be distributed, respectively, to each institution in proportion to FTE enrollment. The level of funds for two-year institutions would be distributed to each institution in proportion to FTE enrollment without regard to type of control.

The annual level of Federal funds for each sector would be determined by averaging, over the prior three years, the difference between total educational expenditures for all institutions of each type and what that amount would have been if educational expenditures had grown at the same rate as the Gross National Product. During recent years educational expenditures have grown at more than two-and-a-half times the rate of growth in GNP. Therefore, it is suggested that the Federal Government should match this difference.

In calculating the difference, the amounts granted to institutions under the formula in the three prior years would be subtracted from previously totaled educational expenditutes to avoid compounding the grant. Thus, the amount not matched by the Federal Government would be raised from sources other than the prior year formula grants.

In the ACE analysis of the proposal cited above, the estimated amount to be awarded to four-year institutions during fiscal year 1968 would have been $43.3 million.

This proposed system has all of the disadvantages discussed earlier in connection with other proposals. It would make use of national averages or totals which may bear little relationship to the circumstances of individual institutions. It would distribute funds in proportion to FTE enrollment without regard to very important differences between institutions of the same size.

However, the suggestion to eliminate the compounding of the Federal grant by reducing expenditures in prior years by the amount of formula grants in those prior years is a good one. But, as with other proposals which make use of institutional averages, incentive features may become very obscure to individual institutions. For example, an institution which used formula funds to increase enrollment relative to all other institutions but with a reduced quality of instruction, might gain the most. An institution which used formula funds to increase the quality of its instruction without increasing enrollment might very easily reduce its share of subsequent formula funds.

The proposal seeks a commitment from the Federal Government with respect to the amount to be appropriated, without passing the advantages of such a commitment on to individual institutions. No institution would be entirely sure what it could expect to receive in any given year.

Matching Federal Scholarship Grants with Institutional Support Grants.—A proposal which was first made by the Carnegie Commission on Higher Education, and has been echoed since by a Presidential Commission on Higher Education Financing, would channel institutional aid through matching Federal scholarships granted to students at those institutions. The proposal could be implemented in either of two ways. The first method would make Educational Opportunity Grants and Work Study allowances available to all eligible high school seniors. It would allow them to take those grants to the institutions of their choice. In turn, those institutions would be reimbursed in proportion to the scholarship funds brought to them by the students. The second would allocate them to institutions, as currently done, on the basis of requests and would match the actual money expended in aid. This method would continue the present procedure for allocating Educational Opportunity Grants and Work Study money to different institutions. In effect, it would increase institutional resources by some amount to cover the cost of instruction of students aided by Federal scholarships.

On the face of it, the first version of the proposal has a great deal of merit. Its proponents expect that it would tend to favor those institutions which cater to low-income students who are eligible for the grants. In practice, there are some difficulties in both administering the system and in setting the reimbursement rate in such a way as to conserve scarce resources. If grants were to be made available to all students accepted by an institution of higher education, placing the determination of need on either a State agency or an arm of the Federal Government could be extremely burdensome administratively. Currently, student aid requirements are provided on an *ad hoc* basis by financial aid offers from given institutions. Although this method probably results in some lack of uniformity in determining need, it has the advantage of stretching Federal aid further because it can be coupled with aid from institutional resources, job placement in the local community, a recognition of regional differences in the cost of living, and the individual circumstances of each student.

A central allocation mechanism by-passing the schools would pose a number of problems, unless acceptance for admission and scholarship money from school resources were stated simultaneously. As long as Federal aid availability is limited and individual grants do not exceed $1,200 or $1,500 per student, it is difficult to see how a decision could be made on an application of a poor student to a high-cost school. If more aid did not become available, some hard decisions might have to be made—for instance whether to approve the funds for a given student who required a high level of aid to attend an institution with high fees, or approve a lower level of aid to the same student for him to attend an institution where the fees were less.

By contrast, if one adopted the matching method of institutional aid and retained the present system of allocating Educational Opportunity Grants and Work Study payments to a given institution, there would be the disadvantage of locking students to institutions which had been able to make a successful case for an award of funds to them. Currently, Educational Opportunity Grants and Work Study payments are distributed to institutions within a State after two levels of decisions. First, the OE decides how much money is to be allocated to each State. Then, the money is divided within the State among the different institutions in some proportion to their requests for funds and the awards in previous years. This does not necessarily result in a distribution of funds proportional to the number of low-income students.

In junior colleges, especially, where full-time study is not as prevalent as in four-year institutions, less Educational Opportunity Grant and Work Study money is requested and received. Also, since many low-income students have to attend college on a part-time basis because of a need to contribute to their family's incomes, the distribution of funds on the basis of a reimbursement formula which allocates institutional resources in proportion to Federal scholarships and grants on a full-time basis may not favor the low-income groups as much as the proponents of the plan anticipate.

Another unresolved issue which has not been widely discussed is the level of reimbursement. Whether the institutional grant is only a fraction of, equal to, or greater than the scholarship, it still raises the problem of proportionality of the reimbursement in relation to the marginal cost of institutions. Institutions with low marginal costs per student aided would make a large profit for every Federally-aided student accepted. These institutions would generally be either junior colleges or State-run institutions of lower prestige. By contrast, the quality institutions whose marginal costs are generally higher could not cover the same proportion of cost of instruction for a grant of the same size. They could still continue to lose money for every Federal student enrolled. Of course, they would be losing less money than otherwise. Nevertheless, in those cases where the differences in cost are caused by genuine differences in the quality of course offerings and level of instruction, this plan may not produce as equitable an allocation of institutional support as is generally believed.

Differential Institutional Payments Based on Estimated Need.—An attempt to develop a proposal which would take into consideration the overriding concern of equalizing the equality of opportunity in higher education has been made by this Office. This version of institutional aid would set the grant to an institution at a proportion of the difference between the average cost incurred to produce a credit hour, and the ability of students to pay for that instruction. It would differentiate between disciplines and level of instruction. In simpler terms, a standard cost for producing a given credit hour in physical sciences, social sciences and humanities, for example, would be estimated for each of the three levels: lower-level undergraduate, upper-level undergraduate, and graduate instruction. This cost would be multiplied by the number of hours provided by an individual institution.

Payments for students whose parents fall into a certain income class (or according to students' income for those who are nondependents) would be determined by subtracting from the total of their living costs plus the full instructional cost, a sum related to their ability to pay. This latter sum could be determined by using a commonly accepted scale such as The College Board Entrance Examination Financial Ability Schedule. The contribution to instructional costs would be determined after living costs had been taken into account. If anything remained after living costs were subtracted from the contribution, this sum would be deducted from the instructional costs incurred by the institution to determine its "bogey" for potential reimbursement. Some percentage of that "bogey" would be reimbursed by the Federal Government.

The method might work as follows. Suppose an institution has four types of students by level of income. Those in the lowest income quartile cannot be expected to contribute anything either to living costs or instructional costs. Those in the second income quartile probably could be expected to just meet their living costs and would not be expected to contribute anything toward instructional costs. Those in the third income quartile could be expected to meet their living costs and to contribute $300 toward instructional costs. Those in the fourth income quartile could be expected to contribute the full cost of instruction after their living expenses were taken into account. The subsidy level for that institution would be calculated by multiplying the number of students in the first and second quartiles by the total instructional costs, the number of students in the third quartile by the instructional costs less $300, and those in the fourth income quartile by instructional costs less $1,450. The result of this calculation for this institution would be added to the results of similar calculations for all other institutions. If the Federal allocation covered 30 percent of the total bogeys, 30 percent would be remitted to the institution. In other words, every institution could determine how much it wished to subsidize students in each income quartile either by some endowment or some State allocation and set its fee structure accordingly.

Institutions with above-average costs of instruction would be subsidized less than those with below-average costs of instruction. If this is considered undesirable, the formula could be changed to take into account the actual cost of instruction, together with a standard mean class size. This modification would tend to encourage institutions to increase or pad the cost of instruction to a larger degree than under the proposals where only average costs for instruction were taken into account.

There are a number of shortcomings to this proposal. The most serious of these is the subjectivity and the judgment which will have to be used in setting reimbursement rates by level and discipline. Secondly, there will be an administrative burden on institutions to collect information about family incomes of students. The third shortcoming is a purely political one. After standards of ability to pay are established, a number of public institutions will have to recognize openly that they are undercharging a large segment of their student population. The subsidies to the affluent will become public knowledge.

Comparisons of the Proposals.—None of the proposals to distribute institutional aid to institutions is without its shortcomings, although the shortcomings of some proposals are greater than those of others. *The Miller Bill,* for example, which advocates distribution of institutional aid based upon Federal research awards in science, student credit hours in science, and earned graduate degrees in science, recognizes the higher costs of providing this kind of instruction, and through its emphasis on awards for research and graduate degrees earned, will tend to benefit institutions of recognized quality. Yet, its virtues are also its shortcomings. It would ignore cost differences between these outstanding institutions while keeping the subsidy to the rest of the higher education universe at a very low level.

The *Bowen Formula* would take into consideration increases in cost and would thus favor institutions which are increasing their enrollments most rapidly. If the reimbursement were set on an average basis, low-cost institutions offering inferior instruction might well benefit more than those with high costs. On the other hand, quality institutions that were in financial straits but did not increase enrollments would not be helped unless the reimbursement were set in terms of actual costs incurred.

The *New York State proposal,* which would reimburse the institutions on the basis of degrees granted, would tend to favor those institutions which have a high retention rate per student admitted. This is desirable, but it could very well result in lower graduation standards and further reduce the quality of higher education.

The *Basic Enrollment proposal* to reimburse all institutions on a full-time equivalent basis has the great merit of treating all institutions equally. By contrast, it ignores those institutions which incur higher costs because of a preponderance of science or graduate programs, and will benefit most those which spend very little money on students.

The *Farrell-Anderson Growth Formula* attempts to bring increased sophistication to the reimbursement rates to institutions of higher education. The proposal to reimburse only that portion of the increase in cost which is over and above the growth of the GNP places the responsibility for continued support for higher education squarely upon the non-Federal sector. Yet, it suffers all the shortcomings of the Bowen Formula.

The *Carnegie Commission proposal* to give institutions matching grants in proportion to Federal student aid and research is most attractive on the surface. If Federal grants followed all needy students, it would tend to channel money in proportion to the needy students in total enrollment. Unfortunately, this is not the case. For example, two-year colleges received less than 12 percent of all Federal student aid, although they enrolled close to 37 percent of entering freshmen in the lowest income quartile in 1968. By contrast, private colleges and universities, which enrolled less than 20 percent of

TABLE 8-1.—*Percent Distribution of Various Federal Support Proposals by Sector and Formula, 1968*

	Bowen Growth Formula		New York State Proposal	Basic Enrollment Formula Based on		F.A. Growth Diff. Formula	Carnegie Comm. Stud. Aid Supp.	Revised Miller Bill	Ability to Pay
	National Data	Sectoral Data		Enrlt.	Enrlt. & Degrees				
All institutions	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Public Institutions	73.9	63.7	62.8	64.4	64.2	62.4	67.0	57.6	75.0
Universities	32.1	30.5	32.8	31.3	30.3	30.0	6.9	40.6	21.5
Four-Year Colleges	23.9	20.9	19.6	22.0	22.8	23.0	53.1	12.8	36.2
Two-Year Colleges	17.9	12.3	10.4	11.1	11.1	9.4	7.0	4.2	17.3
Private Institutions	26.1	36.3	37.2	35.6	35.8	37.6	33.0	42.4	25.0
Universities	11.5	14.0	16.4	13.2	13.3	12.9	2.9	24.4	03.9
Four-Year Colleges	12.9	19.8	19.1	20.6	20.7	23.1	26.6	17.3	17.5
Two-Year Colleges	1.7	2.5	1.7	1.8	1.8	1.6	3.5	.7	03.6

Source: Estimates for all proposals except the cost of Education Supplement to Federal Student Aid, the Miller proposal, and the Ability to Pay proposal are from the American Council on Education, *op cit.* The distribution of funds shown above for the Miller Bill proposal is simply the result of averaging three component distribution with equal weights: (1) the distributions of expenditures on organized research, (2) the distribution of undergraduate enrollment (FTE), and (3) the distribution of advanced degrees awarded. The distribution of the proposed Student Aid Supplement is given by the approximate distribution of funds under the EOG and Work-Study programs. The distribution of the ability to pay proposal is calculated by projecting the known income distribution of entering freshmen by type of institution over four years of college to get income distribution of all students, and then using an average instruction cost per student; assumptions regarding ability to contribute to instructional costs: 1st and 2nd quartiles of family income–$0, 3rd quartile —$300, 4th quartile —$1450.

all lower-income quartile students, received close to one-third of Federal student aid.

Finally, the *Ability to Pay proposal* advanced by OPPE which would reimburse institutions for the differences between a standard cost of instruction and actual costs, and which takes into account the level and course offerings and the ability of students to pay, is most attractive on the surface. It tends to fill the student need gap most effectively. Yet, it too, suffers from shortcomings of arbitrary determination of levels of reimbursement, and probably would be administratively cumbersome.

The impact of different aid formulas by type of institution is quite different. The OPPE formula favors public institutions most heavily and channels a greater share of the aid to junior colleges. The only other formula which comes close to the same effect is the Bowen Formula in its original form, which would reimburse institutions for one-half of the increased costs. If standard costs by type of institution are needed for disbursements of the Bowen Formula, it does not perform very differently from other proposals. At best, these estimates are very approximate, but they do point up, say, in the case of the Carnegie formula, that the lesser participation of junior colleges in scholarship programs may affect the distribution to institutions. The paradox that low-cost, community colleges need smaller incentives to attract students, even though they may run large deficits per student enrolled, argues *a priori* against tying student aid to institutional aid. (See Table 8–1.)

By contrast, the impact of institutional aid, when measured by student income quartile, does not appear to be very different proposal-by-proposal. It would appear that both the Carnegie and OPPE proposals manage to keep down benefits to the top quartile to a minimum. Yet, the overall differences are slight, because of the assumption that all students in an institution benefit equally from student aid. (See Table 8–2.)

Summary and Recommendations.—Since no ideal formula has been found, advocates of institutional aid must base their decisions on a choice of the least of all possible evils. A superior formula must take into consideration some understanding of the manner in which institutional costs arise, the nature of these costs and how they are incurred in offering different types of instruction.

Preliminary study of the nature of costs indicate that they vary drastically by level of instruction. They are lowest for the first two years of undergraduate students, increase somewhat for the upper-level undergraduate students, and then grow dramatically in those institutions which offer graduate instruction. Furthermore, our studies have indicated that instructional outcomes are not directly related to the level of expenditure per student in institutions which are similar. Under such circumstances, we would advocate that any institutional aid formula take into account the level and type of instruction but ignore the cost differences between institutions.

The second requirement for a superior formula is the ability of students to pay for instruction. Institutions with above-average costs which also have students with above-average incomes should be subsidized least. Those with low costs and poorer-than-average students should be subsidized most. With the exception of the Miller Bill, no formula takes into account cost differences, and even the Miller Bill ignores the socioeconomic distribution of the student body. It is probable that the Bowen or Farrell-Anderson Formula, by subsidizing faster-growing institutions more generously, would tend to favor the institutions catering to the poor. But even there the results are attained in an indirect manner. Hence, despite the institutional complexity, we favor the adoption of the formula suggested by

TABLE 8–2.—*Percent Distribution of Various Federal Support Proposals by Income Quartile of Students, 1968*

	Bowen Growth Formula		New York State Proposal	Basic Enrollment Formula Based on		F.A. Growth Diff. Formula	Carnegie Comm. Stud. Aid Supp.	Revised Miller Bill	Ability to Pay
	National Data	Sectoral Data		Enrlt.	Enrlt. & Degrees				
1st Quartile	10%	10%	10%	10%	10%	10%	11%	8%	11%
2nd Quartile	20	19	19	19	19	19	22	18	21
3rd Quartile	29	28	28	28	29	28	29	28	29
4th Quartile	41	43	43	43	42	43	38	46	39

Benefits by income quartiles were inputed on the basis of (a) benefits accruing to institutions, (b) attendance of students from a given income quartile in a given type of institution. Item (b) was estimated by projecting known income distributions of entering freshmen and attrition rates of students by year. The underlying assumption is that all students benefit from institutional aid equally.

OPPE, if a policy of institutional aid is to be adopted at all. The whole matter of the advisability of the adoption of institutional aid is considered in the last section of this report. The present section merely attempted to discuss the issues in analytical terms.

In concluding, it cannot be overstressed that general aid to higher education, because it relies on a formula to distribute funds, cannot be used as a means to promote excellence. Its very strength of spreading money to institutions of higher education on a grand scale mitigates against its use as a means to single out outstanding institutions of exceptional merit. To some extent, centers with distinguished intellectual credentials can be helped by special grants tied to graduate education. These were discussed in Section 7. We do not see any mechanical method of allocating Federal aid tied to academic excellence to liberal arts institutions with no or small graduate programs or research involvement. Perhaps the establishment of a national commission to reward excellent undergraduate teaching, with discretionary power over, say, $50 million, may meet this goal.

Part IV

This part is devoted to estimating financial needs of students and institutions and outlining a program and discussing various alternative levels of Federal aid to higher education.

9. Equality of Educational Opportunity and Student Aid

Alternative Definitions of Equality.—Equality of educational opportunity in post-secondary education may be defined in a number of ways. Several criteria can be used to measure equality: (1) social origins, (2) ability, and (3) aspirations.

Social origins. One may postulate that equality of opportunity is achieved whenever a student, irrespective of the income of his family, is equally likely to attend a post-secondary institution as any other student. Since children of lower-income parents are less likely to graduate from high school, as compared to children from more affluent homes, the achievement of equality, given this measure, would require that a higher proportion of high school graduates who come from lower-income families enroll in college, compared to children from other income groups. Such a policy is actively followed in Eastern Europe where the college admission policies give preference to children of blue-collar workers and farmers.

Ability. Another concept of equality of opportunity would require that all high school graduates of equal ability or achievement have an equal opportunity to enroll in a college and graduate from it. Since there are fewer high school graduates from lower-income groups in proportion to eligibles in the age group, and since, generally, their achievement relative to national norms is less impressive, equality of educational opportunity under this definition could be reached with fewer students from lower-income groups enrolled in post-secondary institutions.

Aspirations. A third definition of equality of opportunity would be satisfied if each high school senior who wished to attend an institution of higher education had a chance to do so. Since the aspirations of children in lower-income groups are lower than those of children in more affluent families—even though this gap is closing—it may be possible to satisfy the requirement stated above with even fewer children from low-income families.

Further Complications in Defining Equality.—The concept of equality of opportunity in post-secondary education is further complicated when one considers not only the requirements for entry, but also the conditions of attendance, i.e. full-time or part-time enrollments, as well as differential rates of continuation in college, which influence the students' chances of completing the college course.

Ambiguity is present even in defining such a seemingly simple concept as enrollment. Is equality of opportunity attained if equal proportions of high school graduates from different income groups enroll in college, relative to their aspirations, but if the children from well-to-do families enroll much sooner than children from poorer homes?

Further, is equality achieved when the total resources available to students from families with different levels of income are equal? How does this reconcile with the family responsibilities or obligations of students from poor families?

It is quite easy to get lost in a definitional problem, and despair of ever being able to estimate the amount of money which may be required to foster any one of the concepts of equality. With three concepts, three or four attendance patterns and three possible levels of required financial aid, as many as 36 alternatives would have to be analyzed. In the short discussion below we have compromised by summarizing the effects of:

1. failure to graduate from high school,
2. differences in attainment due to differences in achievement in high school, and
3. impact of differential entrance and persistence rates.

The rest of this section presents different levels of required student aid based on three assumptions:

1. present pattern of average expenditures,
2. minimum outlays needed to attend a public institution full time, and
3. estimated patterns of actual expenditures by college students.

The calculated amounts of required student aid presented below are based on two enrollment patterns: those of the OPPE projection, which reflects the social demand for education, and those of the complete equality model, which equalizes enrollment, attendance and persistence along the experience of the high-income quartile. The calculations, given the rather crude assumptions on which student aid requirements have been based, must be considered as illustrative. Most economists will feel uneasy that the marginal or incremental cost of attracting a given student is equal to the average cost. Surely, some students will not be able to enroll unless far more generous provisions are made for student aid. Yet, given our present state of knowledge, this is the best assumption which can be made.

Impact of Differentials in Dropout Rates, Achievement, Aspirations, etc.—The estimates which were used in projecting patterns of attendance in Section 3 were based on information about drop-out rates between the tenth and twelfth grade derived from Project Talent data in 1960. To begin with, about 20 percent of the children in the lowest income quartile were estimated to have dropped out between the tenth and twelfth grade. By contrast, only 4 percent of the children in the top quartile failed to graduate from high school. In effect, the failure to complete high school reduced the number of poor children who could attend college by 17 percent relative to the high-income group. The relative impact of the failure to graduate from high school on the chances to attend college are shown for each quartile in Table 9–1.

The poorer high school preparation of children from lower-income families also hurts their chances of enrollment in college. If patterns of enrollment by achievement quartile were equal to those of the high quartile, irrespective of family income, 36 percent fewer children from poor families would enroll in college (see column 2 of Table 9–1).

Also, (and this is shown in column 3 of the table), differences in the students' aspirations to attend college do make a difference. Partly due to poorer preparation, fewer children from poor families aspire to enroll. By comparing the impact of preparation with the data on aspirations, one finds that roughly 10 percent fewer students from poor families are likely to apply, even after their less impressive high school records are taken into account.

The effect of income on the delay in enrollments is quite spectacular. Only four in ten high school seniors from poor families are likely to enroll in college during the first year after graduation, for example, compared to nine in ten from the upper income quartile.

Once poor children enter college, they are more likely to study part time (see column 5 of Table 9–1). If one measures intensity of attendance as the ratio of full-time students in the lowest quartile to those in the top quartile, intensity of the poor is only 74 percent of that of the rich.

The combined effects of poorer preparation in high school, late entry, and part-time study thus result in 70 percent fewer entrants from poor families graduating than students from more affluent homes.

Student Aid Requirements—Assumptions of Enrollment Level.—The estimates of student aid needs presented below have been calculated on the basis of two models of enrollments: the OPPE model, and the alternative "complete equality" model (see Section 3). Both models assume a fixed supply of high shool graduates. Hence, there are no changes in the relationships shown in column 1. The OPPE model takes the relationships in columns 2, 4, 5, and 6 of Table 9–1 and projects a narrowing of the gap in aspirations between income quartiles, in line with the discussion in Section 2 and Appendix B. The "complete equality" model, it will be remembered, set columns 3 through 6 at the level of the highest income quartile. In other words, the OPPE model can be considered as an estimate of enrollments given the aspiration criterion of equality presented at the beginning of this section, and the "complete equality" model as representing the ability criterion.

Amount of Aid—Levels.—It is not clear how

TABLE 9–1.—*Selected Ratios Indicating Differentials in Expectations by Income Quartile to Enter and Continue in College*

Income	Dropouts between 10th and 12th grade	Effect of achievement in high school on college enrollment	Difference in aspiration to go to college	Effect of delay in entering	Ratio of full time to total enrollment	Persistence through college
	(1)	(2)	(3)	(4)	(5)	(6)
Low	.20	.64	.71	.39	.56	.29
2nd	.10	.76	.83	.67	.64	.56
3rd	.04	.88	.89	.85	.64	.71
4th	.04	1.00	1.00	1.00	.76	1.00

Source: OPPE model.

much money is really required or ought to be made available in order for these enrollment projections to be realized. In the discussion below, which applies to full-time undergraduate students exclusively, three different assumptions were made about the needs of students.

Average reported expenditures. The first assumption set the amount of student support required as equal to the average expenditure by income group for full-time students' tuition, fees and reported living expenses in the Project Talent one-year follow-up study. For subsequent years, the tuition and fee outlays were increased by 6 percent from 1960 on, the time the survey was taken, and the living costs by 2 percent, in line with past experience of the behavior of costs of these two items.

Family contributions were calculated by extracting from appropriate tables of the College Examination Board, the amount which could be contributed by a family with two children. In later years, since a 2 percent rate of inflation was assumed, the proportion of the income which would have been contributed if prices did not change was applied to the average income in each quartile, in order to determine the expected contribution.

The first set of estimates—one for the OPPE model, the second for the "complete equality projection"—appears below (see Table 9–2). It should be noted that the average expenditure per student in 1969 is roughly $1,090 for students in the lower income quartile, $1,260 for those in the second income quartile, and $1,400 for students in the third quartile (see Table 9–3).

Hence, although this projection of student aid probably reflects realistically the different costs incurred by students of different social origins, it may be criticized on the basis that the financial need for those in higher income groups is set at a higher level than that for the lower income groups. The total needs for 1976 calculated by this projection amount to $1.4 billion for the OPPE projection and $1.7 billion for the equality projection. (For distributions by quartile see Appendix Table 9–1).

Table 9–2.—*Estimated Levels of Total Financial Aid Requirements Based on Alternative Projections of Full-Time Undergraduate Enrollments*

(Millions of dollars)

	Average reported expenditures		Minimum adequate requirements		Cumulated expenditures	
	OPPE	Equality	OPPE	Equality	OPPE	Equality
1966...	682	....	1342	....	1003	....
1969...	957	....	1578	....	1351	....
1970...	1021	1390	1682	2309	1449	1910
1971...	1080	1438	1780	2396	1567	2031
1972...	1150	1507	1888	2506	1711	2190
1973...	1164	1493	1932	2524	1816	2294
1974...	1289	1647	2081	2700	1953	2452
1975...	1352	1710	2161	2779	2048	2554
1976...	1368	1708	2189	2789	2174	2691

Source: OPPE model.

Table 9–3.—*Estimated Levels of Average Expenditures Per Student Based Upon Alternative Projections by Income Quartile, 1969*

	Low	2nd	3rd	4th	Total
Average reported expenditures.......	1090	1259	1400	1752	1475
Minimum adequate requirements.......	1600	1635	1665	1758	1689
Cumulated expenditures..............	1135	1144	1379	1790	1472

Source: OPPE model.

Minimum adequate requirements. To meet this argument, another projection of financial need was prepared (see Appendix F). It set estimates of expenditure at the minimum level needed to attend a nonresident two-year college during the freshman and sophomore years, and at the estimated expenditures for attending a four-year public college during the junior and senior years. These outlays were estimated for 1966 by the U.S. Office of Education, Bureau of Higher Education, at $103 for tuition and fees in two-year schools, $278 in four-year schools, with living and incidental costs being set at $1,000 for a student living at home, and $1,283 for a student living away from home in a four-year institution (see Appendix Table F–6). As in the case of the first projection, the tuition and fee costs were projected to advance 6 percent a year, and the living costs 2 percent a year.

The average expenses by income quartile, according to this standard, equalize projected outlays across all income groups. The average cost per student in the lowest income quartile in 1969 is $1,600, for instance, and in the third quartile it is $1,665. The gap persists, because we estimate that 70 percent of lowest quartile students have freshmen or sophomore status, compared to 60 percent of those in the third quartile. The higher rate of retention of richer students is mainly responsible for the higher proportion of these students having advanced standing. This projection provides much higher estimates of need in 1976: $2.2 billion and

$2.8 billion for the OPPE and equality projections. (Also see Appendix Table 9–2).

Cumulated expenditures. Both estimates, the ones based on average and minimum adequate costs, indicate that the financial gap will be closed in the near future for students in the third quartile of the income distribution, and that no financial gap does exist for students whose families are in top quartile. To some extent this calculation is a statistical artifice, which compares the expenditure of the average student with the average contribution of a family in a given income quartile.

In real life, the expenditures of students are likely to cover a wide range. Some students are likely to spend less than the average, and their families may not have to contribute very much to their maintenance. By contrast, others may spend more, and the actual expenditures may exceed the average contrubution of parents, even in those circumstances when the expected contribution is quite high.

An estimate of the distribution of expenses by income group was reconstructed from the data of the one-year follow-up of Project Talent. Because of the way the data are presented, certain assumptions had to be made, i.e., it was assumed that students with the lowest tuition and fee expenditures also had the lowest expenses. If this is not true, the estimates slightly understate the financial need. Also, the data are for freshmen students as of 1960. Since that time, a larger proportion of students has been channeled to lower-cost public institutions. It should be noted, as an offsetting factor, that expenditures of more advanced students are generally higher than those of freshmen. This probably more than compensates for the overestimate of expenses due to patterns of attendance shifts.

The new estimates of financial need were derived without offsetting the surplus from families who incurred expenditures below the standard contribution against those families whose contributions exceeded the standard. If the estimated expenditure exceeded the average contribution for a given income quartile, it is cumulated to arrive at the reported financial gap. The financial gap for 1976 under this assumption is $2.2 billion for the OPPE and $2.7 billion for the equality model.

This exercise provides some interesting insights about the real financial pinch which is felt by families in various income quartiles. For example, no financial need is shown for students from families in the third income quartile, when average figures are taken into consideration. Once estimated patterns of outlays are taken into account, the deficit for the same group is a hefty $273 million in 1969 and stays close to this amount through 1976. The financial gap in the upper-income quartile, which did not show up in the more routine calculations of need, amounts to $66 million in 1969 and grows to a quarter of a billion dollars by 1976 once patterns of expenditures are examined more closely. Fees and living costs increase most for the more affluent students, and run ahead of the ability of their parents to contribute, at least in relative terms. (For information by quartile see Appendix Table 9–3.)

An Analysis of Required Level of Aid.—Depending upon the assumptions, required levels of aid vary quite considerably in the short-run for each one of the projections. In the long-run, the total requirements of aid under minimum adequate and cumulated expenditure projections narrow despite the fact that financial need calculated on the basis of the minimum adequate projection is roughly $300 million more for lowest quartile students in 1969 and $430 million in 1976.

In summary, the projection based on actual expenses, averaged out, estimates that the financial need will be $1.0 billion in 1969 and $1.4–$1.7 billion in 1976, depending upon the enrollment projection. Some 71 percent of the funds are required by the lowest quartile students in 1969, and around 90 percent by the same quartile in 1976, with the higher share being required to achieve "complete equality."

For the minimum adequate projection, $1.6 billion is needed in 1969, with 64 percent of the funds going to the lowest-income group. By 1976, the required aid is $2.2 to $2.8 billion, depending upon the enrollment projection with 78 and 74 percent going to the lowest quartile.

Similar estimates of aid are provided by the projection which takes into account actual expenditures. The amount projected is $1.4 billion in 1969, $2.2 billion in 1976 for the OPPE model, and $2.7 billion for the "complete equality" projection. The lowest-income quartile claims 52 percent in 1969 and 59 percent in 1976 for both projections. By contrast, the requirements of the upper-income group grow from 5 percent in 1969 to 11 percent in 1976 if the OPPE model is used to project need and 9 percent under the "complete equality" model. Between 1969 and 1975, the needs of the lower-income group nearly double (from $0.7 billion to

$1.3 billion), and those of the upper quartile nearly quadruples (from $66 million to $244 million).

Conclusion.—The meeting of minimum needs and actual needs of students is likely to produce widely divergent estimates of student aid requirements. This writer believes that the complete equality projection is not likely to be reached unless students in the lowest half of the income distribution are given the minimum adequate grants in addition to the minimum adequate standard. Our projections indicate that aid requirements will be increased under these circumstances by $784 million in 1976 (see Appendix Table 9–4). A realistic projection of student need to achieve the equality assumption must be calculated by adding these figures to the minimum adequate levels for given years, and taking into account the needs of students in the upper half of the income distribution from the cumulative assumption. To achieve these enrollments a level of aid of $3.3 billion in 1971 and $4.1 billion in 1976 would be required.

10. Institutional Finances in the Mid-1970's

One of the great imponderables in projecting the costs of the post-secondary system is the extent to which funds will be found to finance the rising expectations of students. Most predictions of educational outlays project the past trends in expenditures into the future without taking into account the different types of students attracted by the availability of aid or the resulting differences in the distribution of students by type of institution. Nor do projections take into account the availability of public and private moneys to finance the education of all those aspiring to a college career. Certain reservations have been voiced that the increase in costs would be more modest than the one projected on a straight-line basis, because of the interaction of these factors. We examine below the reasonableness of these reservations, and try to arrive at estimates of deficits in post-secondary education by level of instruction, and by income quartile for undergraduates.

Linear projections of past costs.—If past cost increases for the years 1961–62 through 1965–66 are projected, one may anticipate a 14.75 percent increase in costs every five years. Under these circumstances, educational expenditures are likely to increase from the 1965–66 level (the last year for which this information is available) of $1,392 to $1,597 millions in 1970–71 and $1,892 millions in 1975–76.

Alternative projections of cost.—An attempt to reflect more closely the past expansion patterns of institutions for projection purposes was made by (1) projecting incremental enrollments by institution, and (2) trending the costs incurred by these institutions.

The projection was made in the following manner: (1) All institutions for which financial information was obtained for 1961–62, 1963–64 and 1965–66 were matched, (2) they were then ranked in order of expenditure per full-time equivalent students as of 1961–62, (3) the average educational outlays by decile were calculated for all the three time periods, (4) these expenditures and subsidies per full-time student and per standard undergraduate student (see Section 4) were calculated for all three periods, (5) the rate of the growth in enrollment by expenditure decile was calculated, (6) this rate of enrollment growth was then applied to the anticipated growth in enrollments between 1965 and 1970, and 1965 and 1975, (7) the costs incurred were projected as well, and (8) the costs were adjusted up by 10 percent, the amount by which the expenditures in the sample fell short of averages for the years in which the aggregate information was available.

Two projections of trend were attempted. One was for the whole period 1961–62 to 1965–66, another for the period from 1963–64 to 1965–66. Both of these projected trends were applied to the OPPE and equality projections. Because the increase in costs per student was much more pronounced in the early time period, the projections of trends between 1961–62 and 1965–66 provide a somewhat higher estimate of average educational expenditure than do those based on the 1963–64 to 1965–66 trend. The different is approximately 10 percent and is not too wide for our purposes, and under these circumstances, we have adopted the arithmetic mean of these projections in the discussion below.

Table 10–1 shows the mean expenditures per full-time equivalent student for 1970–71 and 1975–76 for both the OPPE and equality projections, and also estimates the total educational outlays of these institutions for these two years. In effect, the mean costs per full-time equivalent student are very close to the straight-line projection: $1,603 for 1970–71 and $1,872 in 1975–76, or $6 more and $20 less than those projected linearly for those two years, respectively.

The educational deficits of institutions.—If educational deficits of institutions are defined as educational expenses less tuition payments, with the help of our model we can estimate total tuition payments and, using the information in Table 10–1, arrive at institutional deficits. As was explained in Section 9, tuition costs were projected to increase at 6 percent a year in line with past trends. The OPPE projection indicates that the total tuition payments in 1970–71 will equal $5.3 billion and $8.1 billion in 1975–76. Hence, the

TABLE 10–1.—*Mean Expenditure Per FTE Student, and Total Educational Outlays 1970–71 and 1975–76*

(a=1961–65 trend, b=1963-65 trend, c=average)

	OPPE		Equality	
	Expenditure per student (dollars)	Educational outlays (billions of dollars)	Expenditure per student (dollars)	Educational outlays (billions of dollars)
1970–71 a..	1663	10.7	1632	11.7
b..	1544	9.9	1534	11.0
c..	1603	10.3	1583	11.3
1975–76 a..	1774	15.0	1767	16.3
b..	2000	16.9	1995	18.4
c..	1872	15.8	1881	17.3

educational deficit which was estimated at $3.5 billion in 1965–66 is likely to grow to $6.0 billion in 1970–71, and grow further to $7.1 billion in 1975–76. In other words, our projection indicates that the bulk of cost increases will probably be borne by students and their sponsors. If the Federal Government adopts a higher level of student aid, and enrollments rise to the levels projected by the equality model, the deficit may grow by one more billion.

Alternative ways of estimating educational deficits.—As startling as this conclusion may be, it is not out of line with the 1963–64—1965–66 experience, when the educational deficit per full-time equivalent actually declined from $762 to $746 per student, and the total deficit of institutions hardly increased. During that period, tuition more than kept up with educational outlays. By contrast, the educational deficit did increase by $55 or 8 percent during the period 1961–62 to 1965–66.

An alternative calculation of the instructional deficit may be attempted by estimating the average educational deficit in 1970–71 to be 8 percent greater than 1965–66, or $806 per full-time equivalent student. This method does not require one to make any assumptions about cost or tuition, but is merely based on projecting public and private subsidies per student. This would place the educational deficit at $5.2 billion during that year, an increase of $1.7 billion over 1965–66. In 1975–76, the educational deficit could increase another 8 percent, or $65 per student, bringing it to $891 per student. Thus the total deficit could amount in 1975–76 to $7.5 billion, or an increase of $2.3 billion in five years. Again, with higher student aid levels, which would encourage higher enrollments, the deficit could be correspondingly higher.

One may accept or reject these figures on the basis of likely trends in tuition increases. If average tuition rates per full-time student increase 80 percent every 10 years, then the educational deficit is likely to grow slowly. If, on the other hand, open-door junior colleges play an increasing role in the post-secondary structure, it is unlikely that tuition will serve to close this gap.

Additional costs incurred by institutions.—In addition to current educational expenses, certain capital costs ought to be added to the operating expenditures of higher education. These costs are the total of depreciation of existing plant, and the costs of capital maintenance. A rough estimate of the depreciation and capital maintenance in 1961–62, 1963–64, and 1965–66 would place these costs at 10 percent of the current educational expense. Thus total deficits incurred in connection with education costs could be a billion more in 1970–71 and between $1.6 and $1.7 billion higher than those merely ascribed to educational costs.

Summary.—We are hampered by the absence of recent information on cost developments from making precise forecasts of the future. But if our projections are realistic, the increases in institutional deficits in the next five years will range between $2.0 and $2.5 billion, depending upon whether only current and fixed costs are included. These estimates assume a considerable increase in student tuition and fees.

11. Alternative Policies for Financing Higher Education

Federal outlays to post-secondary education institutions and students amounted to $4.7 billion in 1969. Of this amount, $1.7 billion went to students and the rest to institutions. Roughly a billion dollars of institutional grants was earmarked for facilities construction, and $1.45 billion for academic research. About $500 million was allotted to various other forms of institutional support such as aid to developing institutions and matching grants to graduate departments.

The amount of Federal outlays in future years will be determined by the interplay of the national interest and the amount of money available for non-defense programs. In this connection, it appears worthwhile to summarize student aid needs under alternative assumptions, as well as the magnitude of institutional deficits and the role which the Federal Government can play in meeting them.

To simplify the discussion below, we adopted as minimum student aid requirements the results of a projection which calculated student need by netting out student outlays against possible family contributions by size-class of expenditure, the so-called cumulative projection. As a maximum, we have adopted a hybrid projection of the minimum adequate and cumulative projection outlined in Section 9. The aid to graduate students has been estimated by assuming a 5 percent increase in stipends, to keep up with cost of living changes, and it was assumed that the Federal Government would continue to support the same proportion of graduate students in 1976 as it did in 1969.

The projections of institutional deficits and the share which may be financed by the Federal Government are more moot. Below, we examine the impact of several subsidy plans and their incidence by income quartile, and attempt to relate them to the overall pressures of higher education outlays on family finances.

Student Aid and Institutional Deficits.—Table 11–1 summarizes some of the highlights of the student aid requirement calculations discussed above. In the case of undergraduate aid, the amount of grants in the lowest two quartiles had been set at the level of the "minimum adequate" expenditures of students. The amount for loans is calculated by adding the amounts spent by undergraduate students in the lowest two quartiles over and above the minimum adequate standards, plus the excess of outlays in the upper two quartiles over expected family contributions.

These amounts may understate the actual needs for two reasons: (1) no aid is earmarked for part-time students, who are eligible for aid under present legislation, and (2) it assumes that the aid will be precisely targeted. Currently, a small proportion of Educational Opportunity Grants and Work-Study payments go to children of parents in the upper-income quartile because they belong to large families. Also, the major part of the Veterans' Administration aid is channeled to students of parents with higher than average incomes. Because of the inexactness of our calculations and the targeting of the aid, we estimate that in 1968 an additional 15 percent of aid was disbursed over and above our calculations of need.

In the case of graduate students, the relative proportion of grants and loans was kept at the 1968 levels. Institutional deficits were adopted from the figures calculated in Section 10. Estimated tuition payments were subtracted from the educational outlays on current accounts, to arrive at the institutional deficits on the current educational accounts. To this figure 10 percent of the educational outlays were added to arrive at an estimate of the capital account deficits.

The 6 percent per year increase in tuition and the growing number of students will cause tuition receipts to increase quite drastically during the decade of the 1970's. The total cost of full-time undergraduate attendance is likely to go up from an estimated $6.1 billion in 1968–69 to $7.2 billion in 1970–71, and $9.5 billion in 1975-76 just to keep up with the demand for higher education.

Levels of Federal Support for Student Aid.—Not all of the student aid requirements will have to be supported by direct aid programs. For instance, in 1969 the Social Security Administration contributed $350 million to college expenses [illegible] students predominantly in the lower half of the income distri-

Table 11–1.—*Aid Needs, Institutional Deficits on the Educational Account, and Outlays for Full-Time Undergraduate Instruction*

(Millions of dollars)

	1971		1976	
	OPPE	Equality	OPPE	Equality
Undergraduate aid	1567	2661	2174	3933
Grants	871	1780	1132	2633
Loans	696	881	1041	1300
Graduate aid	523	588	871	956
Grants	403	453	665	737
Loans	120	135	206	219
Educational outlays (billions)	10.3	11.3	15.8	17.3
Tuition	5.3	6.0	8.1	9.9
Educational deficits current	5.3	5.3	7.1	7.4
Educational deficits total	6.0	6.4	8.7	9.1
Total cost of full-time undergraduate instruction to individual student	7961	9157	11873	13513
Less grants	7090	7377	10741	10880
Less grants and loans	6394	6496	9700	9580

bution. By 1975–76, it is probable that $500 million may become available from this source. Also, institutional and State programs can reasonably be expected to contribute $300 million to student aid. In addition, VA payments will play some role in closing the need gap.

Table 11–2 nets out the institutional aid, and calculates the incidence of possible Federal programs to each income quartile. Non-Federal aid is netted out by income quartile in line with the 1966–67 experience.[1] The incidence of subsidies are calculated by taking (1) the full value of the grants and (2) 30 percent of a four-year moving average of loans, in accordance with present levels of authorized interest rate charges, and the 4⅓ year subsidy period authorized by the law.

Certain Policy Alternatives for Student Aid.—The projections above give a fairly wide range of alternative ways of funding student aid. One projection is based on demand, the other on achieving equality for children with equal scholastic attainment. We have estimated that the latter goal can be met for the upper half of the graduating high school class at roughly the same price as the present demand if all others are excluded from aid. Of course, this policy is likely to be quite unpopular since it would deny to children born of poor families who did poorly in high school a chance to prove themselves in college. It could also force the Federal Government to administer national achievement tests.

If the grant and loan money cannot be found, the alternative is to encourage children from poor families to attend part time, without recourse to student aid. This is not likely to be popular either. Currently, 40 percent of children from families in the lowest quartile are likely to attend college full time. If the full-time participation rate were to be cut down to 20 percent, the needs of students would be reduced accordingly. Educators will point out that completion rates are proportional to full-time attendance, however, and that a further cut-back in full-time attendance by the poor is likely to discriminate against them even further. Also, since the junior college facilities are utilized nearly to capacity, this policy would require massive investment in facilities, which in the short run would cost more than the aid to students.

If these alternatives are discarded, one must face up to the alternative of planning for higher appropriations for direct aid, and the creation of new credit arrangements to finance the increasing demand for loans. In all probability, some sort of

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[1] See *Students and Buildings, op. cit.*, p. 18.

Table 11–2.—*Undergraduate Student Aid Needs for 1976 by Income Quartile and by Proposed Funding, Total Amount and Budget Obligations*

(A = OPPE model, B = Equality model)

(Millions of dollars)

	Need		Non-Federal	Federal share		Grants		Loans		Budget obligations	
	A	B		A	B	A	B	A	B	A	B
Q_1	1274	2361	165	1109	2196	817	1841	292	355	892	1933
Q_2	391	1008	88	303	920	15	491	288	429	89	601
Q_3	265	320	32	233	288			233	288	71	89
Q_4	244	244	16	228	228			228	228	54	54
Totals	2174	3933	301	1873	3632	832	2332	1041	1300	1106	2677

Federally-sponsored institution will have to be established for that purpose, because the needed increase in loan capital will be $400–$500 million a year.

Currently we have no information to justify longer or shorter maturities for student loans. Whether a repayment period of 10, 20, or 30 years should be set is a matter of opinion. As long as college education remains as desirable as it is, and as long as the availability of credit is the crucial problem, the problem of length of repayment takes a back seat in policy discussion.

Graduate Student Support.—As a result of fortuitous circumstances in the past few years, graduate student support by the Federal Government has become less concentrated in the health and scientific areas. The increasing role of the Veterans' Administration and the more catholic grant-making policies of the U.S. Office of Education have spread the scholarships in closer accordance with the desires of the majority of students.

This study indicates that the needs of graduate students are being met at least as adequately as those of undergraduates. Under the circumstances, it is recommended that graduate student support be increased slightly every year, to parallel the increase of student enrollments and higher living costs and standards. This recommendation is contrary to a number of suggestions made by other committees, commissions, and individuals.[2] The writer does not subscribe to the belief that all graduate students should be subsidized. He is convinced that most students with outstanding undergraduate records are already afforded such support.

Facilities Construction Grants.—Facilities construction grants, which accounted for a large part of the Federal support of higher education (they ranged from one-half to one-third of the outlays of the Office of Education for 1968 through 1969), have recently been de-emphasized as a result of the pressures (on the budget) for the continuing support for students. Construction requirements have not been discussed in the body of this study. They were discussed last year in *Students and Buildings* in Chapter 7. We have very little to add to this discussion. Our research this year has not brought forth any new insights about more needs of space to sustain the growing trend of enrollments. If the standard yardsticks are used, undoubtedly the shortages will not be accentuated in the next two years because of the completion of construction undertaken with the encouragement of grants made in 1968 and 1969. Despite reduced budgetary allocations, it is quite probable that the undisbursed funds earmarked from previous years' appropriations will still keep Federal disbursements at a relatively higher rate in 1970.

Beyond that, the future is uncertain. If further cuts in construction funds are sustained by Congress, the effect on the volume of construction cannot be determined. The impact of the cuts may not be as drastic as anticipated because Federal subsidies amounted to only 15 percent of the total amount spent for academic buildings in any one year.

The extent to which the subsidy has been helpful in expanding construction is hard to determine. It is easier to state that there has been great pressure on both private and public institutions to build plants in the past years. Evidence on that subject can be adduced from the increased volume of debt financing which has been used to finance academic buildings. The debt occurred mostly because construction expenditures increased from $2.8 billion to $6.1 billion between 1962 and 1966.

Given this increased reliance on debt, the new method of subsidizing the interest charges of colleges and universities, to be tried for the first time in 1970, needs especially close watching. *A priori,* interest subsidies which do not include guarantees of the principal will be used by public institutions which can put the full faith and credit of the State in which they are located behind these obligations; the same is true of private colleges which have substantial endowments. Private institutions may prefer to borrow at a lower interest rate instead of depleting their endowment.

For the majority of private colleges which have little or no endowment, or for those colleges which cannot obtain State or city guarantees of their bonds, the interest subsidy offers little hope for financing new buildings. Colleges and universities to be accredited must be non-profit and generally they are money-losing propositions. Their expansion implies even greater deficits in the future. Commercial lenders are likely to shun this type of real estate investment unless money can be secured either by assets or by a public authority guarantee.

Because of the avid interest of both Congress and this Administration in the junior college movement, it may be worthwhile to recall that, in a national sample of high school graduates, not one respondent mentioned the lack of college facilities nearby as a reason for not attending college. Among the children of the poor, however, one in six mentioned financial reasons for not planning to attend. These findings may either point to the fact that a sufficient number of institutions already exist, or mean that a number of poor children who did not have access to a community college felt that the financial sacrifice necessary to attend another type of college was too high. Currently the Carnegie Commission on Higher Education has commissioned a special study on the effect of the proximity of junior colleges on attendance patterns by income groups. This study is just beginning. Its results will be worth watching.

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[2] See, for instance, National Science Board, *Toward a Public Policy for Graduate Education in the Sciences,* National Science Foundation, U.S. Government Printing Office: 1968.

Grants for Academic Research.—In the course of the study we have mentioned that graduate education was concentrated in a small number of universities. It was further pointed out that 10 percent of the graduate students probably accounted for 40 percent of the deficits of these institutions. It is noteworthy that the very same institutions which contributed most to graduate education are also recipients of Federal research funds. Current regulations which require that a contribution be made from university resources towards the cost of Federally-funded research merely accentuate the deficits incurred in training graduate students.

A concern for quality, even if this quality is provided at the price of a great deal of inefficiency in the allocation of resources, must take into account the special conditions in these quality institutions. They have established an atmosphere and built a character which is all their own.

If this atmosphere is to be preserved, a change will have to be made in the policy underlying Federal grants, as well as reimbursements for graduate student expenses. This can be done in either of two ways. Instead of asking for a contribution from an institution, an override of 10 percent on research which has been granted to the institution may be put into effect. This would go a long way in solving the financial dilemma of quality institutions. The advantage of this provision is that those institutions which contribute most to the national interest will get the most money.

The other way is to give a cost-of-education allowance to all graduate students attending a given institution. Currently, educational allowances ranging from $2,500 to $3,500 are given to institutions attended by graduate students on Federal stipends. The advantages of this way of subsidizing graduate education are twofold:

A. The money goes where the students choose to attend, and

B. Universities which expend their own resources on the support of graduate students, either as research assistants or teachers, are not penalized for their efforts.

If reimbursements tied to enrollments are introduced, we propose to set higher grants for institutions which have a higher concentration of science students as compared to those which specialize in liberal arts or other offerings.

It is suggested that at least one billion dollars be set aside for institutional support of graduate studies by 1976.

The Case for General Aid.—General aid can be justified for four reasons:

1. If schools catering to the poor suffer at the expense of schools catering to the rich, Federal action to right this imbalance is advisable.
2. College graduates are extremely mobile geographically. Asking States to subsidize them makes little sense since most graduates of State institutions will probably spend the greater part of their productive lives in some other State.
3. Unless general aid is available to post-secondary institutions, tuition charges are likely to increase substantially in the next few years. This may cause a revolt among the affluent, who will try to obtain special-interest legislation, such as a tax credit for tuition payments, which may cost the U.S. Treasury more than a well-devised plan of general aid.
4. Despite indications that the marginal incidence of State and Federal income taxes is similar, differences from State to State may cause a less-than-ideal distribution of burdens. Hence it would be advisable to finance higher education with the U.S. income tax in such a way that the subsidies and the burdens of taxes are more equitably distributed.

These four arguments are examined below.

The Educational Expenditures by School.—If one looks at aggregate figures and postulates that poor students are most likely to be found in the public junior colleges and the teachers colleges, the disparity in cost per standard undergraduate student appears to have widened slightly for students attending junior colleges, compared to all schools, and narrowed imperceptively in comparison to teachers college students and all institutions.

Unfortunately, aggregate figures do not begin to tell the whole story. In the first place, the variation between the class of schools is wide. In the second, a number of teachers colleges have changed their scope in the five years under review and are now classified as liberal arts institutions. In Chapter 5 we examined student expenditures in relation to student ability. Granted that our analysis was based on a limited number of schools, it did indicate that expenditures grew much faster for schools which catered to the academically gifted than for those which enrolled students who scored less on aptitude tests. Since the low scorers are likely to be poorer than the high scorers, this information would indicate that, on the average, fewer resources are being expended upon students from poor families than upon the children of the well-to-do during the latter part of the decade, compared to the early 1960's. The information is not conclusive, but it is disturbing enough to cause grounds for alarm.

Geographical Mobility.—The 1960 Census inquired of respondents their place of residence five years before the Census date. The most highly mobile group were people with high educational attainment. For instance, 12.6 percent of those with between 12 years and 15 years of education changed their residence in the past five years. Among those with 16 or more years of education, 19.0 percent changed their residence in the five years between 1955 and 1960. These higher rates of mobility are a telling argument for national involvement in the financing of higher education. Why pay for folks who move away?

On the other hand, as attractive as this argument is on intellectual grounds, the replacement of State aid to higher education by Federal funds would place a huge new burden on the Federal budget. It is unlikely that two and one-half or three billion dollars can be found in the foreseeable future to replace State expenditures to Federal funds. As was mentioned in Chapter 8 of *Students and Buildings,* about $1.5 billion of the instructional deficit in 1975–76 could be directly attributed to the increased enrollments financed by more generous Federal aid.

The recent reluctance of States to increase the funding of institutions of higher education is pushing the decision about some form of general aid more and more in the forefront of Federal policy discussions.

Burden of College Expenses.—College expenses are consuming an increasingly large share of personal income. It may be well to compare what has been happening to the burden of college expenses in relation to discretionary purchasing power—a concept developed by the National Industrial Conference Board to quantify the amount remaining after net contractual savings and outlays for essential goods and services.

In 1965–66 outlays for full-time student costs were estimated at $4.9 billion, or 1.8 percent of discretionary purchasing power. By 1975–76, they will increase to $11.8 billion or 2.5 percent of the same amount. In the following year, these outlays will be 2.3 percent of discretionary income. If increases in tuition and living costs occur as projected, the one family in ten which sends children to college in a particular year may have a very large portion of its discretionary income consumed by college expenses. Even after grant and loan funds are subtracted from full-time undergraduate outlays, the increase in discretionary purchasing power devoted to paying for full-time undergraduate instruction will increase from 1.4 percent in 1966 and 1.7 percent in 1969 to 2.4 percent in 1975–76 (see Table 11–3).

TABLE 11–3.—*Relation of Student Outlays to Aggregate Discretionary Purchasing Power for Selected Years*

(Billions of dollars)

Year	Discretionary purchasing power [a]	Full-time undergraduate outlays [b]	Percent total student costs of discretionary purchasing power
			Percent
1965–66..........	$266.1	$ 4.9	1.8
1966–67..........	287.9	5.5	1.9
1968–69..........	329.5	6.6	2.0
1975–76..........	484.9	16.6	3.4

[a] 1965-66 and 1966-67 figures derived from *Discretionary Spending, Technical Paper Number 17, Supplement #1*, New York: National Industrial Conference Board, November 1967, Table 6. Other figures are based on straight-line projections of the 1946-66 series on discretionary spending.

[b] Total outlay after loans and grants.

Source: See text.

Incidence of Subsidies and Benefits.—The three reasons cited above certainly make it reasonable to investigate the incidence of benefits and burdens of possible general aid programs.

Marginal incidence of Federal and State taxes.—Since support to students and institutions in the post-secondary sector is a desirable but not crucial activity for Government, it is reasonable to examine the burden of additional tax revenues that support post-secondary education relative to the subsidies accruing to it. The burdens and subsidies to each income quartile will be compared. In what follows, the marginal incidence of Federal and State taxes is estimated for each income quartile.

Since the main source of Federal revenue is the Federal income tax, and since State taxes are gathered from many sources with different rates in different States, we will confine our attention to the marginal incidence of Federal and State income taxes.[3] The marginal incidence of these taxes was estimated as follows: (1) the average income of families and unrelated individuals by income quartile was estimated for the years 1964, 1966, 1970, and 1975 (see Table 11–4); and (2) the marginal tax rates for those average incomes were computed.[4] All results are based on tax schedules that are currently in effect, that is, average tax rates on a given dollar amount of income held constant (see Table 11–5).

TABLE 11–4.—*Average Income of Families and Unrelated Individuals by Quartile: For Selected Years*

Income quartile	1964*	1966*	1970*	1975*
1 (Low)....	$ 2795	$ 3177	$ 3893	$ 4909
2..........	5978	6795	8326	10499
3..........	8487	9647	11821	14906
4 (High)...	16818	19117	23424	29538

* Estimated by projecting 1962 U.S. Census of Population figures to 1964, 1966, 1970, and 1975.
Source: See text.

TABLE 11–5.—*Marginal Federal and State Income Tax Rates of Average Income of Families and Unrelated Individuals by Quartile: For Selected Years*

(Percent)

Income quartile	Federal		State	
	1970	1975	1970	1975
1 (Low)....	16.7	17.3	.52	.55
2..........	19.7	21.0	.67	.68
3..........	21.9	23.8	.85	.92
4 (High)...	29.7	32.7	1.25	1.27

Source: See text.

Marginal tax rates on these estimates of average incomes by quartile for 1966, 1970, and 1975 are rates on an additional dollar of adjusted gross income. They were derived from a special file of about 100,000 Federal tax returns for 1962 processed by the Brookings Institution.[5] The marginal Federal income tax rates of average income of families and unrelated individuals by income quartile for selected years are presented in Table 11–5. It will be noted that as incomes rise in the future and tax rates remain constant, the tax system becomes more progressive. Our calculations indicate that income tax burdens of the upper income quartile are likely to grow fastest in the future.

Similar calculations were performed to derive marginal State income tax rates, and they are also shown in Table 11–5. The last column of the State tax table calculates the incidence of these taxes after the marginal rate of the Federal income tax is deducted, since State income taxes are deductible in calculating Federal income.

On the average, State income taxes are more progressive at the margin than Federal income taxes even after these adjustments. It is true that some States do not have any income taxes, however, and that the incidence of State taxes, State by State, must vary considerably given differences in rates.

Given the relatively progressive incidence of subsidies to students, which are outlined in this section, it is possible to introduce a massive general aid program of aid to institutions, financed either by State or Federal income taxes, and still not violate the rule that the burdens and incidence of subsidies in the middle two quartiles must be roughly equal, and that the top quartile must subsidize the bottom quartile of the income distribution. Table 11–6 shows two such general aid programs, the first amounting to $2.0–$2.5 billion, equal to one-half of the increase in the deficit between 1970–71 and 1971–76, the other for $4.0–$4.5 billion (for different enrollment assumptions) which would allow the deficit increase to be kept down to the same figure, but would also enable institutions to keep tuition levels in 1976 at roughly the 1970–71 levels. The general aid subsidies in this illustration are distributed on the basis of credit hours, and they roughly parallel a proposal of the U.S. Office of Education to distribute subsidies on a *per capita* basis. It should be noted that, under the first alternative, the subsidy is equal to $235–$271 per full-time equivalent student, and under the second proposal it is $472–$488 (see Table 11–6).

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[3] Although the State income tax is not the major component of State revenues, it is becoming more prevalent in all the States as other sources of revenue have become saturated, e.g., the property tax.

[4] To estimate the average income of families and unrelated individuals in 1970 and 1975, by income quartile, the 1962 percentage distribution of personal income of families and unrelated individuals by income quintile, (Herman P. Miller, *Income Distribution in the United States*, U.S. Bureau of the Census (a 1960 Census Monograph), U.S. Printing Office, Washington, D.C.: 1966, p. 3, Table I–1) was translated into income quartiles by means of *Sprague* multipliers. The total income in each quartile is projected forward to selected years, namely, 1964, 1966, 1970, and 1975, at a 5 percent rate of growth of personal income. The estimated number of families and unrelated individuals for the selected years are Bureau of the Census projections for those years (*Statistical Abstracts of the United States*, U.S. Bureau of the Census, 1967, (88th edition), Washington, D.C., 1967, p. 37, Table 39. The simple average of the Bureau of the Census high and low projections was used). Dividing the total income in each quartile by the number of families and unrelated individuals corresponding to it yields the average income of the quartiles for selected years. Table 11–4 shows such estimates for 1964, 1966, 1970, and 1975.

[5] See Joseph A. Pechman, "Individual Income Tax Provisions of the Revenue Act of 1964," *The Journal of Finance*, Volume 20 (May 1965).

Conclusions.—In a period when the function of the post-secondary system is being questioned, this monograph has struck an old-fashioned note of concern about the financial arrangements needed to maintain the revolution of rising expectations. The most important item on the agenda is the provision of student financial aid. We have concluded that targeted student financial aid will have to grow quite substantially to a volume of at least $2.2 billion for undergraduates, and an additional $0.8 billion for graduates by 1975–76.

If more ambitious goals of providing relative equality in educational opportunity are set by the Federal Government, the total bill for student aid may have to increase to $4.1 billion for undergraduates, and $1.0 billion for graduate students. The additional $2.0 billion in aid, we estimate, will result in increased enrollments of 733,000 students. The marginal cost of stimulating these enrollments is between two and three times that of reaching the more modest goal of meeting aspirations. It is $2,700 per student per year and costs $2,200 in Federal appropriations.

Elsewhere, we have expressed concern that resources are not being equalized between different types of schools. If anything, the expenses in the private sector have gone up much faster than in the public sector. This implies that the resources devoted to the education of the well-to-do are growing faster than those of middle class.

We have shown that the present structure of the income tax would make it possible to finance a large institutional aid program and still equalize the incidence of subsidies and burdens by income quartile. It has also been mentioned that the burdens of higher costs in graduate education are placing an inordinate burden on quality institutions.

Ideally, in order to forestall a middle-class revolt against higher tuition, the Federal Government may wish to contemplate a $4.5 billion aid program to institutions, 60 percent of it allocated on a *per capita* basis, and 40 percent tied to graduate and professional school support. In effect, the Federal

TABLE 11–6.—*Benefits and Tax Incidence by Income Quartile of Four Alternative Levels of General Aid*

(A = OPPE model with $2.0 billion; B = equality model with $2.5 billion)

	Benefits (millions)								Incidence
	Student aid		General aid		Total		Percent		Percent
	A	B	A	B	A	B	A	B	
Q_1	892	1933	341	395	1233	2328	39	45	5.2
Q_2	89	601	373	553	462	1154	15	22	13.6
Q_3	71	89	547	702	618	791	20	15	21.8
Q_4	54	54	739	850	793	904	26	18	59.4
Totals	1106	2677	2000	2500	3106	5177	100.0	100.0	100.0

(A = OPPE model with $4.0 billion; B = equality model with $4.5 billion)

	Benefits (millions)								Incidence
	Student Aid		General Aid		Total		Percent		Percent
	A	B	A	B	A	B	A	B	
Q^1	892	1933	682	712	1574	2645	31	37	5.2
Q_2	89	601	745	995	834	1596	16	22	13.6
Q_3	71	89	1095	1263	1166	1352	23	19	21.8
Q_4	54	54	1478	1530	1532	1584	30	22	59.4
Totals	1106	2677	4000	4500	5106	7177	100.0	100.0	100.0

Source: See text.

Government would thus cover roughly one-third of the institutional deficits on current and capital accounts caused by instruction and allied outlays.

Whether a smaller program should be contemplated before all student aid needs are met is controversial. A smaller aid program, say $2.0 to $3.0 billion, can be advocated along the lines that the Federal Government should not only help enrollments, but also ensure the resources to educate these students. The counter-argument is that the States will be able to provide the money, if the students appear at the college door. This is clearly a political judgment.

We have purposely not considered a number of subsidiary programs, such as Aid to Developing Institutions, Talent Search, Upward Bound, or special recruitment programs for disadvantaged students by graduate schools. The moneys needed for these programs is dwarfed by the requirements for student and institutional aid. And, what is more, they have lower priority than solving the basic problems of the system.

When it comes to construction aid, we would lean to providing some moneys for this purpose only in the absence of a general aid program. If fiscal pressures on State and private resources can be reduced in the area of operating funds, it will be easier to find construction money from non-Federal sources.

Finally, it may be interesting to compare our recommendations with those of the Carnegie Commission on Higher Education and a report of a group of Federal officials, "Toward a Long-Range Plan for Federal Financial Support for Higher Education." Both of these reports make estimates of the levels of Federal funding for an "optimal world." The first report calls for $9.1 billion in Federal expenditures (excluding outlays for research) in 1976–77 ($9.4 billion in 1975–76), and the second for $8.0 billion. Recommendations amounting to roughly a billion dollars are outside the scope of this monograph. For optimal conditions we would recommend a Federal program of $3.4 billion for student aid, and $4.5 billion of institutional aid. This compares with $3.4 billion of student aid under the Carnegie proposal and $3.8 million under the Federal proposal. Thus the institutional aid of $3.4 and $3.2 billion envisaged under both proposals is fairly close to our estimate of need.

This study also analyzes what we can live with and still meet the aspirations of most Americans in a less than optimal world. In all probability, the Federal Government can make do with appropriations of $1.8 billion for student aid, and $2.0 billion for institutional support. These lower figures are conditioned on the establishment of channels to provide loans to students.

In all probability, since aid cannot be targeted as effectively as under our assumptions, it would be prudent to provide for a 15 percent additional level in grants, and 30 percent more in loans, for aid targeted to need. Additional outlays, such as veterans' benefits, are not likely to diminish the requirements for targeted aid by their full amount. Hence, an additional plea is made for examining the composition of the aid, as well as its volume.

APPENDIXES

Appendix A. Allocation of Resources to Education—Towards a Theory of Subsidy

by JOSEPH FROOMKIN

The contribution of education to welfare has been analyzed from a number of different angles. Both educators and the general public have looked upon the outputs of education non-quantitatively; education has been regarded by these groups as a means to spread enlightenment, knowledge, and improve the quality of life in a given country. Peripherally, though with increasing frequency, education has been cited as an important ingredient in the preparation of youngsters for the world of work. These statements are based on impressionistic appraisals of trends in employment, and little effort has been exerted to measure the contribution of given types of education to preparation for specific trades or occupations.

Side by side with these impressionistic appraisals of education, a growing body of quantitative literature has been produced, mostly by economists. This research has tried to (1) measure how much the educational effort or the total stock of knowledge contributes to the gross national product, and (2) calculate internal rates of return[1] (profit) to individuals or society from different levels of educational attainment. Economists try to answer questions such as these: How much will the production of goods and services in a country increase if more is spent on education? How much more can a person be expected to earn if he graduates from high school as contrasted to grade school; college as contrasted to high school, etc.? In the second instance, the rate of return has been used to point out the profitability of investment in education as compared to alternative investments, say in plant and equipment.

These two approaches have not been brought together, either by translating the qualitative statements of educators and the general public into more quantitative terms, or by looking at some of the social implications (and the soundness) of the calculations of the quantitative exercises. This is the nub of the dilemma of introducing quantitatively-oriented techniques for decisionmaking into the charting of policy for education.

This chasm may explain why quantitative evaluations of educational policy have failed to influence educational planning even in the U.S., where the technique has been indulged in most actively. Possibly this has occurred because these exercises have failed to produce intuitively reasonable guidelines for the policymaker. For instance, there is general agreement that the needs and social aspirations of lower class students, especially Negroes, are not met by the educational system as it is constituted today. Should the policy of subsidizing the disadvantaged be changed because the internal rates of return from education are lower for Negroes than, say, lower middle-class students? The policymaker will state a resounding "no" to this question. The economist does not have a very good comeback to him, because he has doubts that he is measuring all the relevant factors needed to calculate the correct rate of return. What is even more important, more and more economists are starting to doubt whether the relevant effect of education should be measured in terms of rates of return to individuals or society, or whether education should be looked at as a means of altering the relative distribution of income within our society.

The present paper attempts to present an alternative rationale to justify subsidies to education. As with most pioneering efforts, it raises as many questions as it answers.

Reasons for Questioning Present Quantitative Approaches of Measuring Educational Outputs.—

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[1] Investment in education is measured in terms of the increased lifetime earnings accruing to a given individual. In effect, a rate of return is calculated which equates the increased expected income with the added expense and foregone earnings of continuing education.

* I would like to thank Professor R. Wolfson of Syracuse University, who helped develop the model, and Dr. H. Levin of Brookings for some criticisms. The responsibility for the conclusions is the writer's, and not necessarily shared by U.S.O.E.

Reprinted from OECD, Education and Development, *Budgeting, Programme Analysis and Cost-Effectiveness in Educational Planning*, Directorate of Scientific Affairs, Paris, 1968, pp. 201 ff.

Before attempting to adopt and develop something new, it behooves one to examine critically what has been done before and explain why it is inadequate. The contribution of economists: notably Theodore W. Schultz, and his investment theory of education; Edward F. Denison's estimates of the contribution of education to national productivity; and the work on human investment pioneered by Gary Becker must be examined at the very outset.

An English economist has remarked that "the science of economics is almost as subject to fashions as the art of dressmaking" (Blaug, 205). The investment approach to education, first mentioned by Adam Smith and further elaborated by Alfred Marshall, has received renewed attention as a result of work by T.W. Schultz (Schultz, 1955), and has been further elaborated by a large number of other writers (see bibliography). The major point made by the proponents of this analysis is that past expenditures on education can be regarded as a stock of investment similar to investment in producing durable goods. Hence, education affects the productivity of the current population of a country as much as does the stock of physical capital. Schultz, for one, is willing to ascribe some of the growth in total productivity to investment in man (Schultz, 1962). He makes the point that the productivity of the 1950's or 1960's would be inconceivable with human resources that had the "capabilities per man [that] existed as of 1900 or even 1929 in the United States."

Another writer, Edward F. Denison (Denison, 1962), ascribes 23 percent of the growth of the national product to improvements in the quality of the labor force. He states, "This improvement in the quality of the labor force reflected changes that had been made in education of the young. . . ."

Jorgensen and Griliches in an ingenious article explain the increases in productivity in the U.S. during the period 1945–1965 as a function of quality improvements in capital and labor inputs. According to these two authors, the improvement in the quality of labor accounted for roughly 14 percent of the improvement in productivity (Jorgensen and Griliches, 1967)

If one were to put confidence in these estimates, one could then compare educational investments with other investments open to the economy, and determine the optimal needs to maximize the growth of the national product. Unfortunately, these estimates do not in any way indicate at what point education's contribution to the GNP starts declining, or what level of education is required for certain levels of technology.

The argument that education contributes to productivity has a great deal of intuitive appeal. Yet it cannot be pushed to its logical conclusion without some violence being done to it. If "a Ph.D. pill" were suddenly discovered, giving the total population of the U.S. the level of knowledge attained by Ph.D.'s from leading institutions, it is not likely that the national output would increase dramatically overnight. At best, as workers become interchangeable fractional employment may go down. Some unfilled jobs requiring high skills would be filled. Yet, with present technology, only minimal replacements of labor with capital are probably possible. Hence, until a new technology is introduced, no dramatic shifts in production can be expected.

The investment theory of education is also quite vulnerable if one credits the results of a number of cross-sectional studies. For example, in the U.S., educational attainment by industry does not correlate with the rate of technological change (Jaffe and Froomkin, 1968).

It is also quite possible that, to a large extent, the unexplained residual in the productivity of the U.S. economy is due to statistical problems which produce spurious correlations of increases in educational attainment to productivity. The residual may be due to (1) insufficient weight being placed on the increasing productivity of capital[2]; it may also be (2) accentuated by the problems of using homogeneous production functions to estimate the contribution of labor and (3) the index number methods in the pricing of new products in GNP statistics, which tend to inflate the contribution of labor to GNP. The recent findings by Denison (Denison, 1967) that increases in productivity in Europe were not related to the magnitude of the educational investment add to undermining the confidence of social scientists in this type of analysis.

If educational investment does not contribute to growth of the national product, at least in the short-run, can educational investment decisions be based on the internal rate of return of various avenues of education?

Internal returns from education must be handled gingerly once they are taken out of the context of measures of a contribution to the level of production. They are significant, though, in a number of different contexts: (1) The internal (private) rate of return may be an indicator of the incentive necessary to induce a given proportion of eligibles to strive for a higher educational attainment. It is the reward which individuals expect for investing their time and money to acquire more knowledge. Also, (2) the difference in the rates of return for various levels of education may be used as a guidepost to equalize income distributions. The contributions of education to social externalities, as important as they may be, are not discussed in this paper.

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[2] Jorgensen and Griliches can also be criticized on this ground. Their estimate of capital productivity is based on a narrow look at capital productivity series.

The internal rates of return to education for different levels of attainment are probably determined by some form of "social function of demand for education." How much education is desired probably depends on the level of incomes in a given society, and the relationship of foregone incomes incurred in continuing one's education in relation to the cost of education, and the family income of the student. In other words, the higher the real family income in a society, the higher is the proportion of youths likely to wish to continue education longer; the lower the ratio of starting salaries to family income (or the chance to get an entry job at a young age) the more likely are youths to continue attending educational institutions; if the costs of obtaining an education plus foregone income are higher in relation to family income, the proportion of young people likely to continue their education will be less.

This hypothesis is consistent with the assertion that part of the cost of education is consumption, and part of it is investment. It can be stated in a different way by asserting that the propensity to consume education is income elastic.

For a particular level of education, higher rates of return may be taken as a signpost that there is under-investment in that sector, and that more should be spent to drive the rate of return down. Or one may take the perverse point of view that no additional subsidies can be justified if internal rates are already high. This has been the substance of Professor Friedman's argument that college education should not be subsidized. Actually neither one of these positions is logically consistent with the orientation of a social policy designed to equalize incomes or opportunities. High rates of return to low levels of education, e.g., elementary education, may accrue to individuals in a country where elementary education is already universal, and no additional resources need be added.[3] Conversely, high rates of return from college education may indicate shortages or under-investment, if these rates of return are higher than those from investment in secondary education. Yet it may be necessary to channel investments to secondary education as well as higher education in order to increase the number of students eligible for post-secondary study.

Current rates of return may, under certain circumstances, give a clue to allocation of resources. For instance, in a country with an egalitarian policy, or one which strives to reduce disparities of incomes, educational policy should be tuned in concert with a country's production function. The policy ought to try to fix the supply of educated people in such quantities that each subsequently higher level of attainment produces a lower rate of return than the preceding level. If the supply of labor is such that the internal rates of return for each increment of educational attainment is lower than for the previous one, income disparities within this particular country will be less than if each year of incremental educational attainment is rewarded more.

The Theory of Subsidies.—A most general statement about the objectives of educational subsidies may be presented in the following terms: (1) If the objective of educational policy is to reduce income disparities, (a) investments in education must first produce a monotonically downward slope in internal rates of return for each additional increment in educational attainment, and (b) educational investment policy should attempt further to reduce effective income differentials between different groups of the population by increasing the negative slope of this curve.

We shall limit ourselves below to discussing subsidies and income disparities. If we were to assume that a given rate of return is required to attract some proportion of the population to pursue their education, it is quite possible but unlikely that the internal rates of return for those completing a higher level of education will increase from present levels.[4]

We intend to examine in this paper the relationship between different levels of subsidies to education,[5] the rate of return, and its effect upon lessening income inequalities. As soon as one grants the assumption that a given rate of return is necessary to induce a given proportion of eligibles to be attracted to a given level of education, the only way of reducing the inequalities between those who are well-educated and those who are less well-educated is to reduce the amount of the individual's investment needed to complete a more advanced level of education. If a rate of return for a given level of education i is written as r_i, the investment for the i th level is denoted by I_i, *the difference in income* (Y) for those who have completed it will depend on

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[3] Or these rates may reflect returns to brawn, rather than marginal returns to developing brains.

[4] If rates of return have to be increased, the relative differences in income between levels of education become controlling.

$$\Delta Y_i = F(r_i, I_i) \text{------------------} (1)$$

In the simplest non-dynamic state, a subsidy (S) for level i may result in the acceptance of a smaller income differential than in the absence of the subsidy by that part of the population which chose to pursue their studies up to level i. If out-of-pocket costs after the subsidy are

$$I_{i_s} = I_i - s_i$$

then

$$\Delta Y_{i_s} = F(r_{i_s}, I_{i_s}) \text{--------------------} (2)$$

Actually, the subsidy will affect r_{i_s}, in a number of ways, For instance:

1. The fact that a smaller investment is required to complete a given level of education reduces the risk (R) of not completing this level of education, and hence should reduce the expected rate of return.

This can be represented as follows:

$$\frac{\delta R}{\delta r} > 0 \text{----------------------------} (3)$$

2. The availability of a subsidy is likely to induce some portion of the more able persons to continue their education, as long as ability is a prerequisite for access to higher levels of education. Under these circumstances, those who attain a lower level of education are likely on the average to be less well-qualified relative to those who attain more than would be the case if no subsidy were available.

$$Q_i - Q_{i-1} < Q_{i_s} - Q_{(i-1)_s}$$

As an aside, it should be noted that in those countries where admission to higher levels of education is rationed, highly competitive, and currently subsidized (as is the case of the U.K. in higher education), broadening access on the U.S. non-selective pattern may result in lowering quality and reducing the average rate of return drastically.

3. Similarly, the number of persons (N) attracted to a level of education will increase as the subsidy increases.

$$\frac{\delta N}{\delta S} > 0 \text{----------------------------} (5)$$

4. Just as numbers increase, the effect of the increased numbers is likely to reduce the rate of return (if demand does not change)

$$\frac{\delta r}{\delta N} < 0 \text{----------------------------} (6)$$

5. The effect of the subsidy on the rate of return will hence depend upon (a) the effect of the subsidy on the conception of risk by the students, (b) the influence of supply, given anticipated rates of return, on the rate of return in future years, and (c) changes in quality between students who go on to a higher level of education, and those who do not.

6. The effect of a subsidy on the demand for education needs some comment. The effect of granting a subsidy will raise the perceived rate of return from completing the next level of education given the wage rates set a time before the subsidy was available. Hence a much larger proportion of the population will opt to continue their education than was true hitherto. In effect, in a stationary state, the ex-post return rates will be lower than those anticipated by the first wave of students when they decided to continue studying. The new low rates of return will discourage others in later years from spending more years in school, and eventually, as a result of the drying up of the supply, the rates of return will start rising again. This is nothing more than the familiar cobweb theorem.

In a dynamic society, by contrast, developments may be different. If technology is likely to require a higher proportion of highly educated persons, the subsidy rate may be set to attract more people to higher levels of education attainment in line with future requirements.

Problems of Measurement.—In order to estimate effect of changes in subsidy levels, it will be necessary to collect and look at data about education in a novel manner. We discuss below the kind of statistics which will have to be gathered. This exposition is intended to stimulate a new direction in data collection and analysis.

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[5] Underlying this discussion is the simplifying assumption of homogeneity of offerings by level of education.

Rates of Return to Education—International Comparisons.—Tables A–1 and A–2 reproduce internal rates of return in a number of countries. The figures are not precise, and should be used only as rough magnitudes for purposes of comparison. A number of interesting observations can be made, though, on the basis of the data:

1. Internal rates of return for what may be called roughly the equivalent of a high school education fluctuate in most countries in the range of 12 to 17 percent. The enrollment of eligibles in high school appears to be much more dependent on the level of income in a given country than the rate of return. For instance, the private rates of return for high school are similar in the U.S.A., Mexico and Chile. The proportion of eligibles (defined for this purpose as children aged 15 through 19) in school vary from a low of less than 10 percent in Mexico, to roughly a quarter of the population in Chile, and nearly 80 percent of the population in the U.S.A. The per capita incomes in these three countries were $2,400 in the U.S.A., $400 in Chile, and $200 in Mexico.
2. As a rule the internal rates of return decline for each level of education up to and including high school. In some countries, notably Mexico, the U.S.A., and probably Venezuela, they increase for those who go to or complete college. In those cases, it can be presumed that present post-secondary policies tend to increase concentration of incomes in the upper brackets.
3. There are undoubtedly international differences in propensities to consume education. Nevertheless, the low rates of return in Israel to secondary education, despite relatively higher levels of personal incomes, have depressed secondary attendance rates (Table A–2).

Shifts in Demand and Rates of Return.—Just as there appears to be little international stability between levels of attendance and rates of return, there appear, on the basis of U.S. data, indications that rates of return change over time. It has been extremely difficult to isolate what share of the change is due to shifts in demand, and compare it to change which is due to shifts in quality of the labor force.

The most promising method is to attempt to measure relative changes in wages for a given occupation and educational level for new entrants. New entrants are likely to feel the impact of changes of demand and supply more clearly. Looking at relative changes in wage rates for different educational levels, occupation by occupation, is likely to keep those quality differentials which are translated into wage rates constant, and make it possible to measure shifts in relative wages for two time periods between persons with the same educational attainment (see Table A–3). For instance, in 1960 college graduates aged 25 to 34 earned median wages of $6,240 in professional occupations and $5,361 in the clerical sector. Similarly for high school graduates with no college a median wage of $5,818 was recorded in professional and technical jobs and $4,961 in semi-skilled trades.

During a given interval, one may expect that these differences in quality may persist. Unfortunately, the statistics cited above were collected in the U.S.A. for the first time in the 1960 census. We shall have to wait a few more years to test the reasonableness of this assumption.

Quality and Subsidies.—Persons with the same amount of formal education often earn different amounts, depending upon their native ability. We have implied that the introduction of subsidies may very well accentuate these differences in earnings, as persons with the requisite ability will go on to higher levels of educational attainment. Their earnings will be higher, not only because they are smarter, but also because they can expect some additional return from their education.

There are a number of interesting theoretical implications to this proposition. For instance, if educational subsidies to a given level of students, say college students, are increased, but the number of spaces for college entrants remains constant, it is quite possible that higher education institutions will become more selective, and only admit the most gifted students. Under those circumstamces, the concentration of incomes is likely to increase, rather than decrease. *That is to say subsidies to students must be accompanied by availability of additional places if income concentration is to be lessened.*

We have tried to quantify the range of outcomes by estimating earning differentials due to native ability in a rather crude way (see Table A–4). Taking available data on differentials in earnings for high school graduates to whom military tests of intelligence were given during the Korean War (Cutright, 1967), we have tried to estimate (1) income differentials of high school dropouts, high school graduates, and college-going populations, which could be accounted for by ability differences (Project Talent), and (2) the effect on the differences in incomes between high school and college-going populations, if financial constraints for going to college were removed in the United States (Froomkin, 1968).

Our findings indicate that half of the income differential between dropouts and high school graduates, and one-third of the difference in the income between the population which stops at high school and college graduates can be accounted for by differences in ability. These findings are at variance with those of Becker (Becker, 1964), but are fairly consistent with those for the United Kingdom (Blaug, 1965). As more detailed data covering the total United States become available in the next few months, we shall revise our paper, and become more sanguine about these findings if the new data support them.

Using the same curve of wage differentials relative to ability, we tried to estimate the effect of drawing an increasing number of high school graduates to attend college, on the assumption that financial constraints are removed (Froomkin (2), 1968). Our estimates indicate that the income differential between college students and persons stopping at the high school level is likely to increase further by 1 percent, if these constraints are removed.

Risk and Subsidies.—We know very little about the way risk affects expected rates of return from education. Hence, we can say very little about the way increased subsidies will affect risk.

It is reasonable to postulate school completion rates are related to rates of return. In the United States, for instance, the risk of not completing four years college in the 1950's was roughly double that of not completing high school. The risk also varied by income group. Within a given ability group, the risk of not completing high school for those whose parents were in the lowest socioeconomic group was roughly double the risk for those who were in the highest socioeconomic group. Hence, a reduction of risk through subsidies is likely to decrease considerably the necessary rate of return to attract a given proportion of students to higher education.

Summary.—The objective of this paper was to present an alternative to the conventional theories for the allocation of resources to education. We also indicated some of the variables which ought to be looked at to evaluate the effects of subsidies on the pattern of the distribution of income for the population in order to gauge the effect of these subsidies. Finally, we hope to have conveyed to the reader the necessity of looking at the effects of educational investment serially, rather than in terms of simple inter-temporal analyses.

TABLE A-1.—*Rates of Return to Schooling*

Rates of Return to Schooling

Mexico 1963[a]			USA 1949[b]			USA 1957[c]	USA 1949[d]		USA 1959[d]	Israel 1950's[e]	
Years of Schooling	Private	Social	Years of Schooling	Private	Social	Private	Years of Schooling	Private	Private	Years of Schooling	Private
			1–2	+	8.9						
2–4	21.1	17.3									
			3–6	+	14.5						
5–6	48.6	37.5									
7–8	36.5	23.4	7–8	+	29.2						
9–11	17.4	14.2	9–10	12.7	9.5					9–12	6
			11–12	18.6	13.7	28					
12–13	15.8	12.4									
			13–14	6.2	5.4		13–15	7.4	10.0	13–16	9
14–16	36.7	29.5	15–16	18.7	15.6	15	16+	13.5	15.3		

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a. Martin Carnoy, "Rates of Return to Schooling," Reprint by the Brookings Institution from the *Journal of Human Resources*, July, 1967, p. 368.
b. W. Lee Hansen, "Total and Private Rates of Return to Investment in Schooling," *Journal of Political Economy*, April, 1963, pp. 134–136.
+. This indicates an infinite rate of return, given the assumption that education is costless to the individual to the completion of the eighth grade.
c. Giora Hanoch, "Personal Earnings and Investment in Schooling," unpublished Ph.D. dissertation, University of Chicago, 1965, p. 84.
d. Melvin Borland and Donald Yett, "Trends in Return on Investment in Higher Education," Tables 1 and 5, Rates for Males including those who reported no income. Rates are before taxes.
e. Gary Becker, *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*, (New York: Columbia University Press, 1964), p. 134.

TABLE A-1 (Cont'd).—*Rates of Return to Schooling*

Rates of Return to Schooling

Great Britain[a] 1962–63				Chile 1959[c]		Venezuela 1957[c]		Columbia 1961[c]	
Age	Years of School	Private	Social	Years of School	Social[g]	Years of School	Social[i]	Years of School	Private[l]
				1–6[d]	24	1–6[h]	82	1–5	20
				7–9[e]	29				
								6–11[j]	19
				7–12[f]	17	7–11	17	6–11[k]	30
				13–17	12			12–17	19
15–18	11–13	13	12.5						
19–21	14–16	14[b]	6.5						

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a. Mark Blaug, "The Rate of Return on Investment in Education in Great Britain," *The Manchester School*, Sept., 1965, pp. 259–260.
b. Blaug states "By using the alpha coefficient −.66, we have in fact standardized the earnings of graduates for the distribution of ability and social class origins among secondary school pupils: the evidence shows that undergraduates are a much more homogeneous group than secondary school pupils. Consequently, the private rate of return actually received by graduates is well above 20%," p. 260.
c. Martin Carnoy, "Rates of Return to Schooling," Reprint by the Brookings Institution from the *Journal of Human Resources*, July, 1967, p. 368.
d. Average Schooling 5.5 years.
e. "Special" secondary schooling (average = 8.5 years).
f. General secondary schooling (average = 11.5 years).
g. Rates for males and females.
h. Rate for primary graduates over illiterate urban workers.
i. Rates are probably for urban males only.
j. Technical Secondary School.
k. General Secondary Schooling.
l. Includes tuition. If institutional expenditures in private and public schools are considered equal, these rates are directly comparable to social rates for other countries. Rates for urban males only.

TABLE A-2.—*Rate of Return and Income for Selected Countries*

Country	School Attendance % 15-19 year olds in school	Rate of Return	Mean Income (in 100's of) U.S.A. dollars
Venezuela	13	17	6
Chile	27	17	4
Columbia	11	30	2
Mexico	10	17	2
Israel	25	6	9
United Kingdom	75	13	12
United States	80	18	24

Table A–3.—*Relative Wages and Ability*

	Relative Wage	% in Ability Quartile			
		Dropouts	High School No College	College Dropouts	College Graduates
Ability Quartile					
Low	1.00	54.5	38.5	18.6	2.2
2	1.28	27.0	32.2	16.7	8.7
3	1.48	12.9	21.9	34.0	27.2
High	1.58	5.6	7.4	30.7	61.9
Relative Wage		94	1.00	1.13	1.24

Table A–4.—*Occupation and Median Earnings of Males 25 to 64 Years Old in the Experienced Civilian Labor Force With Earnings in 1959, by Years of School Completed, for the United States: 1960*

Years of School Completed	All Occup. Categ.	Prof. Tech. & Kindred Workers	Farmers & Farm Mgrs.	Mgrs. Officials & Prop. Except Farm	Clerical and Kindred Workers	Sales Workers	Crafts. Fore. & Kindred Workers	Operat. and Kindred Workers	Service Workers Includ. Priv. House.	Farm Laborers and Foremen	Laborers Except Farm and Mine	Occup. Not Reported
Total, 25 to 64 years old	$5,083	$6,978	$2,447	$6,855	$5,216	$5,747	$5,444	$4,645	$3,799	$1,577	$3,504	$4,720
Elementary:												
0 to 7 years	3,400	4,605	1,441	4,477	4,340	3,631	4,385	3,803	2,941	1,204	2,830	3,657
8 years	4,474	5,443	2,414	5,523	4,824	4,580	5,157	4,612	3,624	1,986	3,760	4,399
High School:												
1 to 3 years	5,038	6,102	2,748	6,089	5,102	5,214	5,530	4,900	4,016	2,297	3,977	4,670
4 years	5,541	6,481	3,230	6,750	5,311	5,766	5,903	5,198	4,618	2,772	4,335	5,230
College:												
1 to 3 years	6,119	6,677	3,832	7,826	5,376	6,433	6,139	5,227	4,664	3,242	4,220	5,614
4 years or more	7,664	7,702	4,426	9,486	5,861	7,423	7,565	5,373	4,795	4,181	4,314	6,536
4 years	7,428	7,387	4,406	9,361	5,792	7,358	7,421	5,428	4,873	3,944	4,406	6,533
5 or more	7,968	7,968	4,517	9,777	6,094	7,661	8,037	5,210	4,591	....	4,109	6,541

Source: *United States Census of Population 1960.*

APPENDIX A TABLE A–1.—*Total Funds for R & D Performance, by Industry, 1956–65*

(Millions of dollars)

Industry and size of company	SIC code number[a]	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956
Total		$14,197	$13,512	$12,630	$11,464	$10,908	$10,509	$9,618	$8,379	$7,731	$6,605
Distribution by Industry											
Food and kindred products	20	150	141	130	121	125	104	91	83	74	64
Textiles and apparel	22,23	34	32	30	28	30	38	30	26	15	([b])
Lumber, wood products, and furniture	24,25	13	12	11	10	10	10	12	12	14	([b])
Paper and allied products	26	76	71	69	65	59	56	49	42	35	36
Chemicals and allied products	28	1,377	1,300	1,239	1,175	1,101	980	891	792	705	641
Industrial chemicals	281–82	928	876	809	738	706	666	600	553	503	460
Drugs and medicines	283	268	238	216	195	180	162	154	128	104	94
Other chemicals	284–89	181	186	214	242	215	152	137	111	98	87
Petroleum refining and extraction	29,13	435	410	317	310	299	296	278	246	211	182
Rubber products	30	166	159	156	141	138	121	115	89	107	([b])
Stone, clay, and glass products	32	119	110	100	96	88	88	[c]81	[c]75	[c]69	[c]60
Primary metals	33	216	195	183	171	177	177	152	131	108	([b])
Primary ferrous products	331–32	131	116	106	97	98	102	84	80	64	([b])
Nonferrous and other metal products	333–39	85	79	77	74	79	75	68	51	44	([b])
Fabricated metal products	34	145	148	153	146	136	145	138	162	135	116
Machinery	35	1,129	1,051	958	914	901	949	930	781	669	543
Electrical equipment and communication	36,48	3,167	2,952	2,866	2,639	2,483	2,532	2,329	1,969	1,804	([b])
Communication equipment and electronic components	366–67,48	1,912	1,837	1,773	1,591	1,404	1,324	1,162	868	748	([b])
Other electrical equipment	361–65,369	1,255	1,115	1,093	1,048	1,079	1,208	1,167	1,101	1,056	([b])
Motor vehicles and other transportation equipment	371,373–79	1,238	1,176	1,090	999	936	884	866	856	707	688
Aircraft and missiles	372,19	5,120	5,055	4,712	4,042	3,829	3,514	3,090	2,609	2,574	2,138
Professional and scientific instruments	38	387	324	284	309	297	329	309	294	249	200
Scientific and mechanical measuring instruments	381–82	76	73	70	101	119	160	159	156	139	97
Optical, surgical, photographic, and other instruments	383–87	311	251	214	208	178	169	150	138	110	103
Other manufacturing industries	21,27,31,39	67	60	54	65	105	119	118	105	93	([b])
Nonmanufacturing industries	10–12,14–17, 40–47,49–67,70–79, 89	359	318	276	234	194	168	139	117	([b])	([b])

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[a] Industries, industry groups, and product fields shown separately in statistical tables are classified according to their *Standard Industrial Classification Manual* codes.
[b] Not separately available but included in total.
[c] Estimated by the National Science Foundation.

APPENDIX A TABLE A–2.—*Projected Educational Attainment of the Civilian Labor Force 25 Years and Over, by Sex and Age, 1975*

(Numbers in thousands)

Sex and years of school completed	Total, 25 years and over	25 to 34 years	35 to 44 years	45 to 54 years	55 to 64 years	65 years and over
Both Sexes						
Total: Number	69,857	20,325	15,879	17,745	12,616	3,292
Percent	100.0	100.0	100.0	100.0	100.0	100.0
Less than 4 years high school	39.5	29.2	37.1	43.0	50.2	55.0
4 years high school or more	60.5	70.8	62.9	57.0	49.8	45.0
Elementary: Less than 5 years [1]	2.8	1.1	2.4	3.5	4.3	5.4
5 to 7 years	7.0	3.3	6.0	8.2	10.8	13.5
8 years	9.0	3.8	7.3	10.2	15.1	19.1
High School: 1 to 3 years	20.8	21.0	21.4	21.1	20.0	16.9
4 years	33.3	36.4	33.9	34.3	29.8	18.4
College: 1 to 3 years	11.6	13.3	11.7	10.6	10.0	12.9
4 years or more	15.6	21.1	17.3	12.0	9.9	13.7
Median years of school completed	12.3	12.6	12.4	12.2	12.0	11.1
Male						
Total: Number	45,109	14,208	10,301	10,723	7,790	2,087
Percent	100.0	100.0	100.0	100.0	100.0	100.0
Less than 4 years high school	41.3	30.4	38.7	45.9	54.1	55.8
4 years high school or more	58.7	69.6	61.3	54.1	45.9	44.2
Elementary: Less than 5 years [1]	3.2	1.3	2.9	4.1	5.2	5.7
5 to 7 years	7.6	3.7	6.8	9.1	12.2	13.9
8 years	9.4	4.2	7.9	11.0	16.1	19.5
High School: 1 to 3 years	21.0	21.3	21.0	21.7	20.6	16.7
4 years	29.1	32.6	29.0	29.3	26.3	16.3
College: 1 to 3 years	11.7	13.3	11.9	10.5	9.3	13.6
4 years or more	18.0	23.7	20.4	14.3	10.3	14.3
Median years of school completed	12.3	12.6	12.4	12.1	11.4	11.0
Female						
Total: Number	24,748	6,117	5,578	7,022	4,826	1,205
Percent	100.0	100.0	100.0	100.0	100.0	100.0
Less than 4 years high school	36.4	26.4	34.3	38.6	44.0	53.5
4 years high school or more	63.6	73.6	65.7	61.4	56.0	46.5
Elementary: Less than 5 years [1]	2.0	.7	1.3	2.5	2.9	5.1
5 to 7 years	5.9	2.5	4.6	6.9	8.6	12.8
8 years	8.1	2.9	6.2	9.0	13.3	18.4
High school: 1 to 3 years	20.3	20.4	22.2	20.2	19.1	17.3
4 years	40.8	45.2	42.7	42.1	35.6	22.2
College: 1 to 3 years	11.6	13.4	11.3	10.8	11.1	11.7
4 years or more	11.2	15.0	11.6	8.6	9.4	12.6
Median years of school completed	12.3	12.5	12.4	12.3	12.2	11.4

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[1] Includes persons with no formal education.

Source: Prepared by the U.S. Department of Labor, Bureau of Labor Statistics, consistent with data published by the U.S. Department of Commerce Bureau of the Census in Current Population Reports, Series P–25, No. 305, and with data from the decennial censuses and monthly household surveys of the labor force.

APPENDIX A TABLE A–3.—*Percent Distribution of Civilian Labor Force 25 Years Old and Over by Years of School Completed, Selected Years*

Years of school completed	March 1957–59 average	March 1964–66 average	Projected 1975
Total	100.0	100.0	100.0
Less than 4 years of high school	53.7	45.1	34.0
4 years or more of high school	46.3	54.9	66.0
Elementary: 8 years or less [1]	34.5	26.2	16.0
High school: 1 to 3 years	19.2	18.9	17.9
4 years	27.8	32.8	39.5
College: 1 to 3 years	8.4	9.6	11.1
4 years or more	10.2	12.5	15.4
Median years of school completed	11.4	12.2	12.4

[1] Includes persons with no formal education.
Source: Bureau of Labor Statistics.

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Appendix B. Description of the Enrollment Model for 1960–76

Introduction.—The model used to allocate past enrollments for the period 1960–67 by ability and income quartiles and to project enrollments for the years 1968–76 was built up by: (1) using projections of high school graduates in each year, (2) allocating them to four ability and four socioeconomic quartiles, (3) applying estimated probabilities to the entry into the post-secondary system from each of 16 cells in the year of graduation and during subsequent years, and (4) applying to the enrollees differential survival rates from year to year. The total enrollment estimated by the model is a summing of these calculations.[1]

$$E_t = \sum_{s} \sum_{n} \sum_{i} \sum_{r} d_{s,i,r} \cdot f_{s,i,r} \cdot r_{s,i,r} \cdot P_{s,n,i,r} \, G_{s(t-n+1),i,r}$$

The sources used for the estimates were: (1) NCES estimates of high school graduates, (2) Project Talent data from the one-year and five-year followups of the high school class of 1960, (3) U.S. Bureau of the Census attendance by age information for the period 1964–66, and (4) information about college-going intentions from two surveys conducted by Project Talent in the one-year follow-up survey.

The following discussion will describe the steps used in estimating the parameters for the model, and will identify the sources of the data on which these estimates are based.

Estimates of the Number of High School Graduates.—The number of high school graduates, separately for males and females, was taken from National Center for Educational Statistics data and estimates for the years from 1949 to 1976, published in U.S. Department of Health, Education, and Welfare, U.S. Office of Education, *Projections of Educational Statistics, 1976–77,* (Government Printing Office, Washington, D.C.: 1968), Table 17.

Estimates of High School Graduates by Ability and Income Quartile.—The distribution of high school graduates by income and ability quartiles was established by splicing information from Project Talent one-year follow-up data with U.S. Bureau of the Census information. The method is described below.

Adjustments to Project Talent Data.—Data from Project Talent were classified by grouping them into four groups according to the socioeconomic index and another four groups based on aptitude test scores. Table B–I shows the tabulation of March 1960 tenth-grade males taken from the December 1963 reinterview and classified by these two variables.

TABLE B–I.—*Percentage of Tenth-Grade Males By Aptitude and Socioeconomic Indexes: March, 1960*

Socioeconomic Index Percentile	Aptitude Index Percentile				
	0–25.2	25.3–46.2	46.3–71.3	71.4–100.0	Total
0– 31.5.	13.9	8.2	6.0	3.4	31.5
31.6– 58.6.	6.3	6.3	7.9	6.6	27.1
58.7– 81.4.	3.5	4.4	6.9	8.0	22.8
81.6–100.0.	1.5	2.1	4.3	10.7	18.6
Total....	25.2	21.0	25.1	28.7	100.0

Two kinds of adjustments were made before the data were used for the enrollment model: (1) the data were adjusted to represent more precisely characteristics of students quartile by quartile, and (2) occasional statistical anomalies were smoothed.

Adjustment of Data to Meet Quartile Bounds for Ability and Socioeconomic Status.—The data shown in Table I were adjusted to reflect new class limits bounded by the 25th, 50th, and 75th percentile of the two indexes as follows:

(1) The data of Table B–I were cumulated as shown in Table B–Ia.

(2) At each of the three lower percentile points on the Socioeconomic Index, the value at each aptitude percentile was expressed as a ratio to the total number of students at or below that point. This yields the conditional probabilities that a student will fall at or below the given points on the aptitude scale, given his position on the Socioeconomic Index scale. The Socioeconomic Index

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[1] For explanation of symbols and subscripts, see Note 1 at end of Appendix B.

Table B–Ia.—*Tenth-Grade Males, Cumulative Percent of Total By Aptitude and Socioeconomic Indexes: March, 1960*

Socioeconomic Index Percentile	Aptitude Index Percentile			
	25.2	46.2	71.2	100.0
31.5.........	13.9	22.1	28.1	31.5
58.6.........	20.2	34.7	48.6	58.6
81.5.........	23.7	42.6	63.4	81.5
100.0.........	25.2	46.2	71.2	100.0

percentile points shown were regressed against the conditional probabilities at each aptitude point independently. The following functions were derived:

$$P_{a}(25.2) = 51.7 - .2735P_s \qquad \frac{R^2}{.984}$$

$$P_{a}(46.2) = 80.6 - .347P_s \qquad .996$$

$$P_{a}(71.2) = 97.7 - .2566P_s \qquad .989$$

where:

$P_a(_n)$ = The conditional probability of a child being classed at or below the given aptitude percentile given.

P_s = The Socioeconomic Index percentile at or below which a child is classified.

(3) The equations were used to estimate the values at the 25th, 50th, and 75th percentile points on the aptitude scale (see Tables B–Ib and B–Ic).

Table B–Ib.—*Tenth-Grade Males, Cumulative Percent of Total By Aptitude and Socioeconomic Indexes: March, 1960*

Socioeconomic Index Percentile	Aptitude Index Percentile			
	25.0	50.0	75.0	100.0
25.0.........	11.4	19.0	23.6	25.0
50.0.........	19.4	33.7	43.9	50.0
75.0.........	23.8	44.0	61.0	75.0
100.0.........	25.0	50.0	75.0	100.0

Table B–Ic.—*Tenth-Grade Males, Percent of Total By Aptitude and Socioeconomic Indexes: March, 1960*

Socioeconomic Index Percentile	Aptitude Index Percentile				
	0–25.0	25.1–50.0	50.1–75.0	75.1–100.0	Total
0– 25.0.	11.4	7.6	4.6	1.4	25.0
25.1– 50.0.	8.0	6.7	5.6	4.7	25.0
50.1– 75.0.	4.4	5.9	6.8	7.9	25.0
75.1–100.0.	1.2	4.8	8.0	11.0	25.0
Total...	25.0	25.0	25.0	25.0	100.0

Number of high school graduates.—Table B–II, taken directly from Project Talent tabulations, shows the rates at which tenth-grade males graduated from high school at each point on the cumulative indexes.

Table B–II.—*Percentage of 1960 Tenth-Grade Males Who Graduated From High School in Four Years By Aptitude and Socioeconomic Index Percentiles: December, 1963*

Socioeconomic Index Percentile	Aptitude Index Percentile			
	25.2	46.2	71.2	100.0
31.5.........	72.1	75.4	77.7	79.6
58.6.........	75.3	78.8	82.5	84.9
81.5	74.5	78.8	83.5	86.6
100.0.........	74.8	79.6	84.6	88.5

The following function describing the data of Table B–II was calculated by least-square multiple regression:

$$P_g = 65.8 + 14.3P_a + 7.9P_s \qquad \frac{R^2}{.919}$$

where:

P_g=The percentage of high school graduates given.

P_a=The percentile point at or below which a student is classified on the aptitude index.

P_s=The percentile point at or below which a student is classified on the Socioeconomic Index.

The calculated values for the 25th, 50th, 75th, and 100th percentiles are shown in Table B–IIa.

Table B–IIa.—*Percentage of 1960 Tenth-Grade Males At or Below Each Aptitude and Socioeconomic Index Percentile Who Graduated From High School in Four Years: December, 1963*

Socioeconomic Index Percentile	Aptitude Index Percentile			
	25.0	50.0	75.0	100.0
25.0.........	71.3	74.9	78.5	82.1
50.0.........	73.3	76.9	80.5	84.1
75.0.........	75.3	78.8	82.4	86.0
100.0.........	77.2	80.8	84.4	88.0

Multiplying the ratios of Table B–IIa times the ratios shown in Table B–Ib and disaggregating the result yields estimates of the aptitude and socioeconomic distribution of high school graduates. This result is shown in Table B–IIb.

TABLE B–IIb.—*Estimated Percentage of Total 1960 Tenth-Grade Males Who Graduated From High School By Aptitude and Socioeconomic Index Percentiles*

Socioeconomic Index Percentile	Aptitude Index Percentile				
	0–25.0	25.1–50.0	50.1–75.0	75.1–100.0	Total
0– 25.0.	9.2	6.9	4.9	2.3	23.3
25.1– 50.0.	6.9	6.4	5.8	5.3	24.4
50.1–75.0..	4.2	5.8	7.0	8.5	25.5
75.1–100.0.	1.6	4.9	8.3	12.0	26.8
Total...	21.9	24.0	26.0	28.1	100.0

The data shown in Table B–IIb represents the distribution of male high school graduates used as base for the enrollment model. Identical procedures were used to estimate the distribution of female high school graduates. Results for females are shown in Table B–IIc.

TABLE B–IIc.—*Estimated Percentage of Total 1960 Tenth-Grade Females Who Graduated From High School By Aptitude and Socioeconomic Index Percentiles*

Socioeconomic Index Percentile	Aptitude Index Percentile				
	0–25.0	25.1–50.0	50.1–75.0	75.1–100.0	Total
0– 25.0.	8.4	6.8	5.2	3.0	23.4
25.1–50.0.	6.6	6.6	6.2	5.6	25.0
50.1–75.0..	4.3	6.0	7.1	8.2	25.6
75.1–100.0.	1.9	5.4	7.9	10.8	26.0
Total...	21.2	24.8	26.4	27.6	100.0

The resulting socioeconomic distribution is extremely close to other statistics, e.g. unpublished data on the family income of 1960 high school graduates supplied by the U.S. Bureau of the Census and tabulated by the Bureau of Applied Social Research, Columbia University. This is shown in Table B–III.

TABLE B–III.—*Approximate Family Income Distribution of 1960 High School Graduates*

Family Income		Percent of 1960 High School Graduates
Class	Percentile	
Under $3,337.......	0– 25.0	22.4
$3,338–5,625........	25.1– 50.0	24.9
$5,626–8,397........	50.1– 75.0	26.7
$8,398 and over.....	75.1–100 0	26.0
		100.0

The information used in constructing the Project Talent socioeconomic index for families is highly correlated with family income. Throughout the model this variable is used as a proxy for family income.

Enrollment rates.—Similar procedures were used to adjust the rates of enrollment in college and mean rates of attainment as obtained from the Project Talent first and fifth-year reinterviews of the 1960 high school graduating class.

Rates of enrollment and rates of attainment were obtained directly from Project Talent tabulations at the cumulative percentile points on the socioeconomic and aptitude indexes which were near the desired points. Langrangian interpolation procedures were then used to estimate the corresponding ratios for the desired boundaries by quartile for each of the two classifying variables independently.

First-year enrollments for 1960 in the year following graduation were calculated from Project Talent. This distribution by the 16 income-aptitude cells for each sex appears in Tables B–IV and B–V.

For previous and subsequent years to 1960, the first-time enrollment rate was adjusted on the basis of information described in Section 2 which indicated that the propensity to enroll in college had increased roughly proportionately for all income groups for the period 1939 to 1960 and had grown at different rates between 1960 and 1966. A further assumption was made that the pattern of change between 1960 and 1966 would continue for ten years to 1976; namely, that by 1973 enrollments in the first, second, and third quartile would reach the levels experienced in the next higher quartile. It was assumed that enrollment propensities in the fourth quartile would asymptotically reach 80 percent; thus the gap between current enrollment and 100 percent enrollment would be closed at the rate observed between 1960 and 1966. (Table B–VI)

TABLE B–IV.—*First-Time Enrollment Rate of High School Graduates in College in the Year Following Graduation*

Male

Income	Low	2	3	High
Low........	.078	.168	.333	.536
2...........	.142	.245	.399	.698
3...........	.163	.366	.514	.753
High........	.209	.362	.640	.793

TABLE B–V.—*First-Time Enrollment Rate of High School Graduates in College in the Year Following Graduation*

Female

Income	Low	2	3	High
Low........	.085	.125	.219	.429
2...........	.095	.157	.283	.565
3...........	.165	.249	.451	.639
High........	.269	.477	.630	.854

TABLE B–VI.—*Rate of Change in the Propensity to Enroll in College (1944 to 1976)*

	Income Quartile			
Year of H.S. Graduation	Low	2	3	High
1944.........	.160	.321	.415	.572
1945.........	.161	.321	.416	.574
1946.........	.161	.321	.417	.577
1947.........	.161	.322	.418	.580
1948.........	.162	.322	.420	.584
1949.........	.162	.323	.423	.588
1950.........	.163	.324	.426	.592
1951.........	.165	.326	.429	.596
1952.........	.167	.328	.433	.601
1953.........	.169	.330	.438	.607
1954.........	.173	.334	.444	.612
1955.........	.177	.339	.451	.619
1956.........	.184	.345	.459	.625
1957.........	.193	.353	.469	.632
1958.........	.204	.363	.480	.640
1959.........	.219	.376	.493	.648
1960.........	.239	.392	.506	.656
1961.........	.263	.412	.522	.664
1962.........	.293	.435	.539	.673
1963.........	.327	.461	.557	.682
1964.........	.365	.490	.576	.691
1965.........	.405	.520	.595	.700
1966.........	.445	.550	.614	.709
1967.........	.483	.579	.633	.718
1968.........	.517	.605	.651	.727
1969.........	.547	.628	.668	.736
1970.........	.571	.647	.684	.744
1971.........	.591	.664	.698	.752
1972.........	.606	.677	.710	.760
1973.........	.617	.687	.721	.768
1974.........	.626	.695	.730	.775
1975.........	.633	.701	.739	.781
1976.........	.637	.706	.746	.788

In application of these factors, the enrollment was never allowed to exceed the ever-enrolled rate in any quartile.

Mathematically, this was represented as follows: upper and lower asymtotes K_1 and K_2 were chosen for each income quartile—the upper asymtote K_2 to represent the limits of growth indicated above and the lower asymtote K_1 to represent the proportions of first-time enrollment in 1944. The values of K_1 and K_2 were chosen as follows:

TABLE B–VII

Income Quartile	$K_{i,1}$	$K_{i,2}$
Low............	.16	.65
2..............	.32	.72
3..............	.41	.75
High...........	.57	.80

A logistic curve of the form

$$y_{i,t} = K_{i,1} + \frac{C_i}{1 + e^{a+bx}}$$

(x = year and y = propensity to enroll) was fitted to a pair of known points of each income quartile. The pairs of points described in Section 2 are given below:

TABLE B–VIII

Income Quartile	1960	1966
Low............	.23	.46
2..............	.40	.52
3..............	.52	.65
High...........	.68	.74

First-time enrollments for each year from 1960 to 1967 were weighted in the model by the ratio of

$$r_{t,i} = \frac{y_{t,i}}{y_{1960,i}}$$

Enrollments of students in years other than the year following graduation were estimated by using the ratios published by the U.S. Bureau of the Census, the proportion of high school graduates who enrolled in college one year after graduation with those aspiring to enroll. These ratios were used in preference to Project Talent ratios of ever-enrolled to those enrolled in the first year because of anomalies in the Project Talent data probably due to inflation problems in the five-year followup. (Table B–IX)

TABLE B–IX.—*Rates of First-Time Enrollment in College By Years After High School Graduation*

(Census)

Income Quartile	Years After High School Graduation						
	1	2	3	4	5	6	7
Low.......	.5	.21	.13	.06	.05	.04	.02
2..........	.7	.13	.07	.04	.03	.02	.01
3..........	.8	.08	.05	.02	.02	.02	.01
High.......	.9	.04	.02	.02	.01	.01	—

Persistence Rates.—The number of years a student was likely to be enrolled in the system was calculated by using Project Talent data and adjusting marginal totals to U.S. Bureau of the Census observed enrollment rates.

- Given enrollment by year, the maximum possible achievement for the 1960 cohort was estimated.
- The actual achievement was then calculated by using Project Talent four-year followup interviews. (Table B–X)
- The ratio between possible and actual achievement was then used to calculate the survival rates. This is shown in Table B–XI.
- Beyond five years, the survival rates were projected on the basis of a straight-line fit, to a maximum of ten years or until the value reached zero.

The calculated values were then used to simulate an enrollment cohort for the year 1965. Adjustments were made in the calculated cohort survival rates to have the cohort tally estimates made by the U.S. Bureau of the Census for 1964–1966.

The new survival rates were then used to estimate cohort enrollment rates by sex, income, and aptitude for the period 1960 through 1976. These are reproduced in Table B–XI.

Mathematical Representation of the Model.—The mathematics of calculating the cohorts is as follows:

If the symbol $a_{i,m}$ represents the number of first-time enrolled in college in the i-th income quartile, m-years after high school graduation, then from the values given in Table B–IX the maximum possible proportion of the total years of attainment in K years for any given cohort of high school graduate is given by:

$$R'_{i,K} = \frac{\sum_{m=K}^{n} a_{i,m}}{\sum_{m=1}^{n} a_{i,m}} \quad \text{for } K = 1, 2, \cdots n$$

Similarly, using the values in Table B–X the actual attainment in K years of enrollment of the cohort of high school graduates may be calculated by sex, income, and aptitude quartiles.

$$R''_{S,i,J,K} = \frac{\sum_{m=K}^{n} b_{S,i,J,m}}{\sum_{m=1}^{n} b_{S,i,J,m}} \quad \begin{array}{l}\text{for } K = 1, 2 \cdots\cdots m \\ \text{for } S = 1, 2\end{array}$$

The survival rates in Table B–XI for each of the 16 income and aptitude quartiles will then be given by the ratio:

$$R_{S,i,J,K} = \frac{R''_{S,i,J,K}}{R'_{i,K}}$$

TABLE B–X.—*Rates of Actual Attainment in College Given Ever Enrollment in Five Years*

		Male					Female				
Income Quartile	Aptitude Quartile	Freshman	Sophomore	Junior	Senior or BA	Grad. or Prof. Work	Freshman	Sophomore	Junior	Senior or BA	Grad. or Prof. Work
1	1	.198	.484	.099	.203	.017	.417	.143	.163	.267	.011
	2	.314	.229	.091	.340	.027	.244	.174	.093	.469	.020
	3	.264	.091	.066	.335	.244	.154	.211	.050	.496	.090
	4	.044	.188	.103	.403	.263	.073	.127	.079	.586	.135
2	1	.272	.253	.148	.310	.016	.179	.522	.074	.220	.006
	2	.300	.255	.140	.216	.089	.134	.273	.190	.295	.108
	3	.131	.163	.168	.401	.137	.279	.130	.155	.368	.068
	4	.145	.076	.124	.428	.227	.127	.109	.168	.398	.199
3	1	.489	.146	.198	.141	.026	.422	.039	.130	.322	.087
	2	.223	.244	.132	.336	.065	.187	.349	.098	.320	.046
	3	.194	.172	.086	.322	.226	.199	.151	.137	.425	.089
	4	.050	.136	.117	.396	.300	.063	.154	.119	.428	.236
4	1	.201	.164	.158	.369	.108	.050	.496	.265	.144	.045
	2	.137	.199	.132	.333	.199	.213	.230	.079	.277	.202
	3	.050	.207	.120	.409	.215	.180	.146	.141	.422	.112
	4	.040	.077	.106	.332	.446	.025	.107	.065	.567	.238

Source: Project Talent 5th Year Interview.

TABLE B–XI.—*Persistence Rates in College in First Five Years After High School Graduation By Sex, Income, and Aptitude*

Income Quartile	Aptitude Quartile	Male					Female				
		1	2	3	4	5	1	2	3	4	5
1	1	1.0	.530	.360	.290	.030	1.0	.598	.498	.371	.021
	2	1.0	.720	.520	.360	.050	1.0	.798	.658	.655	.038
	3	1.0	.770	.750	.580	.120	1.0	.894	.719	.784	.171
	4	1.0	.850	.800	.700	.210	1.0	.978	.904	.965	.257
2	1	1.0	.700	.520	.380	.020	1.0	.848	.323	.264	008
	2	1.0	.730	.480	.360	.120	1.0	.894	.639	.471	.150
	3	1.0	.900	.770	.630	.190	1.0	.744	.637	.509	.094
	4	1.0	.890	.850	.770	.310	1.0	.902	.824	.697	.267
3	1	1.0	.520	.380	.180	.030	1.0	.590	.562	.451	.105
	2	1.0	.790	.550	.440	.080	1.0	.830	.484	.404	.056
	3	1.0	.820	.660	.600	.270	1.0	.819	.679	.567	.108
	4	1.0	.970	.800	.760	.360	1.0	.957	.816	.732	.286
4	1	1.0	.800	.660	.530	.120	1.0	.951	.468	.199	.050
	2	1.0	.860	.680	.560	.220	1.0	.788	.574	.505	.222
	3	1.0	.950	.770	.660	.240	1.0	.822	.696	.563	.123
	4	1.0	.960	.910	.820	.500	1.0	.976	.896	.847	.261

The 16 rates of enrollment in college over K years, given the probability of enrollment at any time after graduation, was calculated from the above by "entering" students for the first time m years after high school graduation and applying the survival ratio $R_{s,i,j,k}$ to those enrolled and then summing for each of the K years. The equations giving the 16 enrollment curves are derived as follows:

Let the matrix

$$C_{s,i,J,m,K} = a_{i,m} R_{s,i,J,(K-m+1)}$$

where $a_{i,m}$ are the entries in Table B–IX and the R_s are the survival curves calculated by equation 6.

Summing the resulting C matrix for each of the K years over m yields the enrollment rates for each of the 32 sex, income-aptitude cells.

$$S_{s,i,J,K} = \sum_{m=1}^{n} C_{s,i,J,m,K} \quad \text{for } K = 1, 2 \cdots n$$

Since, however, the Project Talent distribution of first-time enrollment by income and aptitude appeared to be more reliable than the "ever-enrolled" data obtained from the five-year survey, the curve was adjusted to apply to first-time enrollment by transformation:

$$P_{s,i,J,K} = \frac{S_{s,i,J,K}}{S_{s,i,J,1}}$$

The Project Talent data accounted for only the first five years of enrollment after high school graduation. The enrollment curve was therefore adjusted for years beyond five to simulate the total population included in the U.S. Bureau of the Census estimates. The adjustment factors for males and females are:

TABLE B–XII.—*Adjustment Factors On Enrollment Rates*

	Years After High School Graduation									
	1	2	3	4	5	6	7	8[2]	9[2]	10[2]
Males........................	1.0	1.0	1.1	1.12	1.25	1.25	1.5	8.25	8.25	8.25
Females......................	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0425	1.0425	1.0425

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[2] These years in the Census data represent five-year age intervals, hence, the larger factor.

The enrollment rates, based on first-time enrollment in the first year following high school graduation, for males and females, are presented in Table B-XIII.

TABLE B-XIII.—*Enrollment Rates in College Based on First-Time Enrollment*

Income Quartile	Aptitude Quartile	Male									
		1	2	3	4	5	6	7	8	9	10
1	1	1.00	.95	.84	.70	.41	.26	.16	.08	.04	.01
	2	1.00	1.14	1.08	.89	.52	.33	.21	.11	.05	.02
	3	1.00	1.19	1.33	1.21	.75	.51	.30	.18	.10	.04
	4	1.00	1.27	1.42	1.38	.91	.72	.43	.25	.14	.07
2	1	1.00	.89	.75	.60	.23	.13	.08	.04	.02	.01
	2	1.00	.92	.72	.58	.32	.15	.09	.05	.02	.01
	3	1.00	1.09	1.04	.92	.48	.34	.15	.09	.04	.02
	4	1.00	1.08	1.12	1.07	.63	.56	.37	.16	.08	.04
3	1	1.00	.62	.49	.28	.22	.12	.11	.02	.03	.01
	2	1.00	.89	.69	.57	.41	.30	.18	.11	.06	.02
	3	1.00	.92	.80	.74	.42	.31	.29	.18	.10	.05
	4	1.00	1.07	.96	.93	.54	.51	.47	.22	.12	.06
4	1	1.00	.84	.72	.57	.37	.15	.09	.05	.02	.00
	2	1.00	.90	.74	.63	.58	.34	.10	.06	.03	.01
	3	1.00	.99	.83	.74	.64	.49	.27	.08	.04	.01
	4	1.00	1.00	.97	.90	.59	.53	.45	.33	.21	.07
						Female					
1	1	1.00	1.02	1.01	.86	.48	.30	.19	.10	.05	.02
	2	1.00	1.22	1.25	1.26	.68	.43	.26	.15	.08	.03
	3	1.00	1.31	1.35	1.44	.89	.53	.32	.19	.11	.05
	4	1.00	1.40	1.57	1.72	1.11	.65	.39	.24	.14	.06
2	1	1.00	1.03	.58	.47	.18	.11	.07	.03	.01	.00
	2	1.00	1.08	.91	.74	.40	.18	.11	.06	.03	.01
	3	1.00	.93	.88	.76	.34	.17	.10	.06	.03	.01
	4	1.00	1.09	1.09	1.00	.58	.24	.14	.08	.04	.02
3	1	1.00	.69	.68	.57	.23	.09	.06	.04	.02	.01
	2	1.00	.93	.63	.53	.17	.09	.06	.03	.02	.01
	3	1.00	.92	.82	.71	.25	.11	.07	.04	.03	.01
	4	1.00	1.06	.97	.90	.46	.14	.09	.06	.04	.02
4	1	1.00	1.00	.53	.26	.10	.04	.02	.01	.00	.00
	2	1.00	.83	.63	.57	.29	.05	.03	.02	.01	.00
	3	1.00	.87	.75	.63	.19	.05	.03	.02	.01	.00
	4	1.00	1.02	.96	.93	.35	.07	.05	.03	.01	.00

Full-time equivalent enrollment students were estimated from total enrollment by weighting the estimated number full-time students by the ratio of years attained to years attended, obtained from Project Talent data. The ratios are given below:

TABLE B-XIV.—*Ratio of Years Attained Per Years Attended*

Income Quartile	Male Aptitude				Female Aptitude			
	Low	2	3	High	Low	2	3	High
Low	.691	.711	.774	.886	.726	.778	.739	.849
2	.676	.744	.819	.901	.738	.763	.785	.889
3	.679	.767	.844	.924	.714	.758	.835	.897
High	.661	.831	.894	.946	.763	.816	.867	.950

Estimates of Full-Time Students.—Full-time enrollment by ability and income quartile was calculated from total enrolled by applying differential rates of full-time attendance for each of the 16 groups. It was assumed that part-time students carried a one-third load. Given the above ratios of years attained per years attended, it was possible to calculate the full-time students with the equation:

$$y_{s,i,j} = a_{s,i,j} + \frac{1}{3}(1.0 - a_{s,i,j})$$

where:

y = Years attained per years enrolled.

a = Ratio of full-time enrolled to total enrolled.

These estimates were applied to the 1964 cohort, the year for which NCES did their last full-time/part-time census and were scaled to reproduce the NCES estimates. The scaling factor used was .92 on the years attained to years attended ratio.

The estimates used in the model appear in Table B–XV below:

TABLE B–XV.—*Ratios of Full-Time Enrollment to Total Enrollment By Sex, Income, and Aptitude*

Income Quartile	Male Aptitude				Female Aptitude			
	Low	2	3	High	Low	2	3	High
Low	.454	.481	.569	.723	.502	.574	.520	.672
2	.433	.526	.630	.743	.519	.553	.583	.727
3	.437	.559	.665	.775	.486	.546	.652	.738
High	.412	.647	.733	.805	.553	.627	.696	.810

Graduate and First-Professional Degree Students.—Estimates of graduate and first professional students are derived in the model in two steps. For the years 1960–1967, NCES estimates of total graduate students by sex were adopted. For the period 1968 through 1976, they are projected as a function of total enrollment based on the fitting of the following function to the period 1960 through 1967:

$$y_{s,t} = a S_{s,t}^{b}$$

Where $s_{s,t}$ = total enrollment and $y_{s,t}$ = NCES estimate of graduate students, the calculated coefficients and exponents were:

a = .054 for males, .027 for females.

b = 1.15 for males, 1.18 for females.

The estimated number of graduate students was increased 25 percent, to account for first professional students, in line with observed differences between students enrolled in programs in the fifth year of college as estimated by the U.S. Bureau of the Census and the total graduate enrollment reported by NCES for the period 1964–1966.

The number of full-time graduate students by income quartile and by year was estimated by weighting the relative distribution of all full-time, total enrolled graduate students by an appropriate ratio in each income quartile.

In 1965, the ratio of full-time to total graduate students was 44 percent. The ratio of all full-time to total enrolled students was 63 percent. Hence, a weight of $\frac{.44}{.63} = .7$ was applied to the ratio of full-time to part-time students in each income cell by sex. For instance, in 1965, the estimate of all full-time students to total male students in the high income cell was .95. It was, hence, estimated that the proportion of full-time graduate students was .95 × .7 = .665 of total enrolled graduate students.

The estimated number of full-time graduate students was subtracted from the estimated number of total full-time students to derive the number of full-time undergraduate students enrolled.

NOTE 1

Explanation of Symbols (Equation 1)

E = Total Enrollment.

d = Distribution of High School Graduates by Sex, Income, and Aptitude.

f = First-Time Enrollments in College in Year Following High School Graduation by Sex, Income, and Aptitude.

r = Rate of Growth in the Propensity of High School Graduates to Enroll in College by Income, 1944–1976. Table B–VI

P = Enrollment Rates in College in Years after High School Graduation, Given First-Time Enrollment in First Year Following High School Graduation by Sex, Income, and Aptitude. Tables B–IV, B–V.

G = Estimated Number of High School Graduates by Sex. Source: US Office of Education Publication Projections of Educational Statistics to 1976–1977.

Subscripts:

t = Current Year.

s = Sex.

i = Income Quartile (1 = low, 4 = high).

j = Aptitude Quartile (1 = low, 4 = high).

n = Years Since High School Graduation.

Appendix C. List of Colleges by Control and Level of Program Offered

Public Schools with Graduate Program

1001	Appalachian St. Tea. C.	N.C.
1002	California State C.	Pa.
1003	Clemson U.	S.C.
1004	Colorado S. U.	Colo.
1005	Delaware, U. of	Del.
1006	East Carolina C.	N.C.
1007	Fresno St. C.	Calif.
1008	Georgia State C.	Ga.
1009	Maine U. Pf.	Maine
1010	Michigan St. U.	Mich.
1011	Millersville St. C.	Pa.
1012	Newark C. of Eng.	N.J.
1013	N.C. Chapel Hill	N.C.
1014	N.C. Greensboro, U. of	N.C.
1015	Pittsburgh, U. of	Pa.
1016	Rhode Island, U. of	R.I.
1017	Rutgers The St. U.	N.J.
1018	Salem, St. C. at	Mass.
1019	Shippensburg St. C.	Pa.
1020	Slippery Rock St. C.	Pa.
1021	Texas A&M U.	Tex.
1022	Texas Tech. C.	Tex.
1023	Vt. & St. Ag. C., U. of	Vt.
1024	Va. Polytechnic Ins.	Va.
1025	Virginia, U. of	Va.
1026	Western Carolina C.	N.C.
1027	William & Mary, C. of	Va.
1028	Winthrop C.	S.C.

Public Schools with No Graduate Program

1001	Citadel Military C.	S.C.
1002	Douglass C.	N.J.
1003	Mary Wash. C., U. Va.	Va.
1004	Womans C. of Georgia	Ga.

Private Non-Religious Schools with Graduate Program

1001	Amherst C.	Mass.
1002	Antioch C.	Ohio
1003	Beloit C.	Wis.
1004	Bennington C.	Vt.
1005	Bowdoin C.	Maine
1006	Brandeis U.	Mass.
1007	Bridgeport, U. of	Conn.
1008	Bryn Mawr C.	Pa.
1009	Calif. Inst. of Tech.	Calif.
1010	Carnegie Inst. Tech.	Pa.
1011	Chapman C.	Calif.
1012	Chicago, U. of	Ill.
1013	Clark U.	Mass.
1014	Clarkson C. of Tech.	N.Y.
1015	Colby C.	Maine
1016	Colgate U.	N.Y.
1017	Colorado C.	Colo.
1018	Columbia U.	N.Y.
1019	Conn. C.	Conn.
1020	Cooper Union	N.Y.
1021	Cornell U.	N.Y.
1022	Duke U.	N.C.
1023	Elmira C.	N.Y.
1024	Emerson C.	Mass.
1025	Franklin & Marshall C.	Pa.
1026	George Washington U.	D.C.
1027	Gordon C.	Mass.
1028	Goucher C.	Md.
1029	Hobart C.	N.Y.
1030	Hollins C.	Va.
1031	Ithaca C.	N.Y.
1032	Johns Hopkins U.	Md.
1033	Lawrence U.	Wis.
1034	Lehigh U.	Pa.
1035	Macalester C.	Minn.
1036	Mass. Inst. of Tech.	Mass.
1037	Miami U.	Ohio
1038	Middlebury C.	Vt.
1039	Mills C.	Calif.
1040	Mt. Holyoke C.	Mass.
1041	Occidental C.	Calif.
1042	Phila. C. Pharm. & Sci.	Pa.
1043	Pratt Inst.	N.Y.
1044	Reed C.	Oreg.
1045	Rensselaer Poly. Ins.	N.Y.
1046	Rochester, U. of	N.Y.
1047	Rose Polytech. Inst.	Ind.
1048	St. Johns C.	Md.
1049	St. Lawrence U.	N.Y.
1050	Sarah Lawrence C.	N.Y.
1051	Simmons C.	Mass.
1052	Smith C.	Mass.
1053	Springfield C.	Mass.
1054	Suffolk U.	Mass.
1055	Swarthmore C.	Pa.
1056	Trinity C.	Conn.
1057	Tufts C.	Mass.
1058	Tulane U. of Louisiana	La.
1059	Union C.	N.Y.
1060	Vassar C.	N.Y.
1061	Wellesley C.	Mass.
1062	Wells C.	N.Y.

1063	Wheaton C.	Mass.
1064	Whitworth C.	Wash.
1065	Williams C.	Mass.
1066	Worcester Poly. Inst.	Mass.
1067	Yale U.	Conn.

Private Non-Religious Schools with No Graduate Program

1001	Agnes Scott C.	Ga.
1002	Bard C.	N.Y.
1003	Barnard C.	N.Y.
1004	Bates C.	Maine
1005	Carleton C.	Minn.
1006	Centre C. of Kentucky	Ky.
1007	Chatham C.	Pa.
1008	Coe C.	Iowa
1009	Denison U.	Ohio
1010	Dickinson C.	Pa.
1011	Grove City C.	Pa.
1012	Hamilton C.	N.Y.
1013	Hiram C.	Ohio
1014	Hood C.	Md.
1015	Lake Erie C.	Ohio
1016	Marietta C.	Ohio
1017	Norwich U.	Vt.
1018	Parsons C.	Iowa
1019	Pomona C.	Calif.
1020	Principia C.	Ill.
1021	Radcliffe C.	Mass.
1022	Ripon C.	Wis.
1023	Shimer C.	Ill.
1024	Skidmore C.	N.Y.
1025	Sweet Briar C.	Va.
1026	Transylvania C.	Ky.
1027	Ursinus C.	Pa.
1028	Wabash C.	Ind.
1029	Washington & Lee U.	Va.
1030	Washington C.	Md.
1031	Westmont C.	Calif.
1032	Wilson C.	Pa.

Private Religious Schools with Graduate Program

1001	Anderson C.	Ind.
1002	Assumption C.	Mass.
1003	Austin C.	Tex.
1004	Barry C.	Fla.
1005	Bethel C. & Seminary	Minn.
1006	Boston C.	Mass.
1007	Canisius C.	N.Y.
1008	Catherine Spalding C.	Ky.
1009	Clarke C.	Iowa
1010	Dayton, U. of	Ohio
1011	Drew U.	N.J.
1012	Duquesne U.	Pa.
1013	Earlham C.	Ind.
1014	Fairfield U.	Conn.
1015	Ft. Wright C., Holy Name	Wash.
1016	Furman U.	S.C.
1017	Gannon C.	Pa.
1018	Georgetown U.	D.C.
1019	Gonzaga U.	Wash.
1020	Goshen C.	Ind.
1021	Holy Cross, C. of the	Mass.
1022	Holy Names, C. of the	Calif.
1023	Immaculate Heart C.	Calif.
1024	LaSalle C.	Pa.
1025	Lewis & Clark C.	Oreg.
1026	Loretto Heights C.	Colo.
1027	Manhattanville C. S. H.	N.Y.
1028	Marygrove C.	Mich.
1029	Moravian C.	Pa.
1030	Mt. St. Mary's C.	Calif.
1031	Nazareth C. of Rochester	N.Y.
1032	Notre Dame, U. of	Ind.
1033	Ohio Wesleyan U.	Ohio
1034	Providence C.	R.I.
1035	Puget Sound, U. of	Wash.
1036	Redlands, U. of	Calif.
1037	Rosary C.	Ill.
1038	St. Johns U.	Minn.
1039	St. Joseph's C.	Pa.
1040	St. Mary's C.	Ind.
1041	St. Michael's	Vt.
1042	St. Rose, C. of	N.Y.
1043	St. Thomas, C. of	Minn.
1044	St. Xavier C.	Ill.
1045	San Francisco, U. of	Calif.
1046	Scranton, U. of	Pa.
1047	Seattle Pacific C.	Wash.
1048	Siena C. St. Bernadine	N.Y.
1049	South, U. of the	Tenn.
1050	Southern Methodist U.	Tex.
1051	Stetson U.	Fla.
1052	Texas Christian U.	Tex.
1053	Trinity C.	D.C.
1054	Trinity U.	Tex.
1055	Valparaiso U.	Ind.
1056	Villanova C.	Pa.
1057	Wagner C.	N.Y.
1058	Webster C.	Mo.
1059	Westminster C.	Pa.
1060	Wheaton C.	Ill.
1061	Wittenberg U.	Ohio
1062	Yeshiva U.	N.Y.

Private Religious Schools with No Graduate Program

1001	Albertus Magnus C.	Conn.
1002	Albright C.	Pa.
1003	Alma C.	Mich.
1004	Arkansas C.	Ark.
1005	Baker U.	Kans.
1006	Beaver C.	Pa.
1007	Caldwell C. for Women	N.J.
1008	Capital U.	Ohio
1009	Carroll C.	Wis.
1010	Catawba C.	N.C.
1011	Cedar Crest C.	Pa.
1012	Columbia C.	S.C.

1013	D'Youville C.	N.Y.
1014	Davis & Elkins C.	W. Va.
1015	Dunbarton C. Holy Cross	D.C.
1016	Elmhurst C.	Ill.
1017	Florida Southern C.	Fla.
1018	Geneva C.	Pa.
1019	Georgian Court C.	N.J.
1020	Gettysburg C.	Pa.
1021	Good Counsel C.	N.Y.
1022	Greensboro C.	N.C.
1023	Hamline U.	Minn.
1024	Hanover C.	Ind.
1025	Hartwick C.	N.Y.
1026	Hastings C.	Nebr.
1027	Heidelberg C.	Ohio
1028	Holy Family C.	Pa.
1029	Hope C.	Mich.
1030	Juniata C.	Pa.
1031	Kalamazoo C.	Mich.
1032	Kenyon C.	Ohio
1033	Keuka C.	N.Y.
1034	Ladycliff C.	N.Y.
1035	Lafayette C.	Pa.
1036	Lake Forest C.	Ill.
1037	Lycoming C.	Pa.
1038	Macmurray C.	Ill.
1039	Marian C. Indianapolis	Ind.
1040	Mary Baldwin C.	Va.
1041	Marylhurst C.	Oreg.
1042	Marymount C.	N.Y.
1043	Marymount Manhattan C.	N.Y.
1044	Mercyhurst C.	Pa.
1045	Merrimack C.	Mass.
1046	Mt. Mercy C.	Pa.
1047	Mt. St. Vincent, C. of	N.Y.
1048	Muskingum C.	Ohio
1049	New Rochelle, C. of	N.Y.
1050	Newton C. Sacred Heart	Mass.
1051	Notre Dame C. of Md.	Md.
1052	Notre Dame C. Staten Island	N.Y.
1053	Ottawa U.	Kans.
1054	Otterbein C.	Ohio
1055	Park C.	Mo.
1056	Presbyterian C.	S.C.
1057	Queens C.	N.C.
1058	Randolph Macon Wom. C.	Va.
1059	Roanoke C.	Va.
1060	St. Andrews Presby. C.	N.C.
1061	St. Bernard C.	Ala.
1062	St. Catherine, C. of	Minn.
1063	St. John Fisher C. in	N.Y.
1064	St. Joseph C.	Md.
1065	St. Joseph C. for Women	N.Y.
1066	St. Mary of Woods C.	Ind.
1067	St. Marys Dominican C.	La.
1068	St. Norbert C.	Wis.
1069	St. Olaf C.	Minn.
1070	St. Peter's C.	N.J.
1071	St. Vincent C.	Pa.
1072	Seton Hill C.	Pa.
1073	Southwestern at Memphis	Tenn.
1074	Southwestern U.	Tex.
1075	Steubenville, C. of	Ohio
1076	Stonehill C.	Mass.
1077	Upland C.	Calif.
1078	Wesleyan C.	Ga.
1079	Westminster C.	Mo.
1080	Wofford C.	S.C.

Appendix D.
Correlation tables by control and level of program offered

APPENDIX TABLE D-1.—*Combined sample of schools*

N=273

	VERBAL MEAN	MATH MEAN	EXPENDITURES	TUITION	PERCENT GRADUATE SCHOOL	NUMBER OF PH. Ds 1920–60	NUMBER OF PH. Ds 1960–66	NUMBER OF PH. Ds 1920–66	ENROLLMENT	PERCENT MALE	RESEARCH STAFF	STUDENT TEACHER RATIO	FACULTY WITH PH. D.	PERCENT TEACHER BACHELORS DEGREES	PERCENT TEACHER GRADUATE DEGREES
VERBAL MEAN	1.0000	.8717	.6459	.6773	.3839	.4019	.3767	.4009	.0710	-.0567	.2028	-.5083	.4428	-.4879	-.0545
MATH MEAN	.8717	1.0000	.6615	.6189	.4576	.5093	.5293	.5257	.2034	.3464	.2872	-.4291	.4174	-.5442	-.0410
EXPENDITURES	.6459	.6615	1.0000	.5725	.3977	.5074	.5186	.5207	.1012	.1193	.3550	-.5564	.3138	-.3909	-.0546
TUITION	.6773	.6189	.5725	1.0000	.2979	.2484	.1846	.2314	-.1924	.0461	.1086	-.4855	.3497	-.4776	-.0373
PERCENT GRADUATE SCHOOL	.3839	.4576	.3977	.2979	1.0000	.3465	.3347	.3490	.0929	.3678	.1796	-.2701	.1355	-.1983	.0064
NUMBER OF PH.D.s 1920-60	.4019	.5093	.5074	.2484	.3465	1.0000	.9178	.9908	.5982	.2794	.5636	-.2250	.2453	-.2432	-.0189
NUMBER OF PH.D.s 1960–66	.3767	.5293	.5186	.1846	.3347	.9178	1.0000	.9630	.6852	.3496	.6646	-.1807	.2079	-.2517	-.0148
NUMBER OF PH.D.s 1920–66	.4009	.5257	.5207	.2314	.3490	.9908	.9630	1.0000	.6390	.3085	.6085	-.2142	.2372	-.2507	-.0179
ENROLLMENT	.0710	.2034	.1012	-.1924	.0929	.5982	.6852	.6390	1.0000	.2924	.4646	.2201	.0439	-.0735	.0228
PERCENT MALE	-.0567	.3464	.1193	.0461	.3678	.2794	.3496	.3085	.2924	1.0000	.2021	.1140	.0337	-.3182	.1024
RESEARCH STAFF	.2028	.2872	.3550	.1086	.1796	.5636	.6646	.6085	.4646	.2021	1.0000	-.1862	.0612	-.1420	-.0123
STUDENT TEACHER RATIO	-.5083	-.4291	-.5564	-.4855	-.2701	-.2250	-.1807	-.2142	.2201	.1140	-.1862	1.0000	-.0597	.3032	.1052
FACULTY WITH PH.D.	.4428	.4174	.3138	.3497	.1355	.2453	.2079	.2372	.0439	.0337	.0612	-.0597	1.0000	-.2059	-.0588
PERCENT TEACHER BACHELORS DEGREES	-.4879	-.5442	-.3909	-.4776	-.1983	-.2432	-.2517	- 2507	-.0735	-.3182	-.1420	.3032	-.2059	1.0000	.0152
PERCENT TEACHER GRADUATE DEGREES	-.0545	-.0410	-.0546	-.0373	.0064	-.0189	-.0148	-.0179	.0228	.1024	-.0123	.1052	-.0588	.0152	1.0000

Appendix Table D–2.—*Public schools with graduate programs*

N=28

	VERBAL MEAN	MATH MEAN	EXPENDITURES	TUITION	PERCEN T GRADUATE SCHOOL	NUMBER OF PH.Ds 1920–60	NUMBER OF PH.Ds 1960–66	NUMBER OF PH.Ds 1920–66	ENROLLMENT	PERCENT MALE	RESEARCH STAFF	STUDENT TEACHER RATIO	FACULTY WITH PH.D.	PERCENT TEACHER BACHELORS DEGREES	PERCENT TEACHER GRADUATE DEGREES
VERBAL MEAN	1.0000	.8413	.5305	.3660	.0101	.6785	.5805	.6570	.5237	.2039	.3772	−.2619	.3124	−.4010	−.3116
MATH MEAN	.8413	1.0000	.5068	.3381	.1306	.6589	.5671	.6393	.4373	.6001	.3291	−.3939	.0181	−.4915	−.2993
EXPENDITURES	.5305	.5068	1.0000	.6714	.0446	.6935	.5386	.6509	.3924	.2618	.6248	−.2641	.2040	−.4822	−.2132
TUITION	.3660	.3381	.6714	1.0000	.2532	.4324	.1568	.3384	.0163	.0631	.7035	−.4850	.0313	−.1175	−.0291
PERCENT GRADUATE SCHOOL	.0101	.1306	.0466	.2532	1.0000	.0327	−.0919	−.0557	−.1544	.2077	−.0143	−.0998	−.3390	.4713	.0488
NUMBER OF PH.D.s 1920–60	.6785	.6589	.6935	.4324	−.0327	1.0000	.9058	.9872	.7682	.4609	.6890	−.1746	.1915	−.5530	−.1729
NUMBER OF PH.D.s 1960–66	.5805	.5671	.5386	.1568	−.0919	.9058	1.0000	.9618	.9097	.4677	.5330	−.0250	.2019	−.5224	−.1850
NUMBER OF PH.D.s 1920–66	.6570	.6393	.6509	.3384	−.0557	.9872	.9618	1.0000	.8389	.4739	.6459	−.1222	.1998	−.5540	−.1814
ENROLLMENT	.5237	.4373	.3924	.0163	−.1544	.7682	.9097	.8389	1.0000	.3298	.4268	.2076	.3310	−.4122	−.1546
PERCENT MALE	.2039	.6001	.2618	.0631	.2077	.4609	.4677	.4739	.3298	1.0000	.2167	−.1811	−.3897	−.5024	−.0935
RESEARCH STAFF	.3772	.3291	.6248	.7035	−.0143	.6890	.5330	.6459	.4268	2167	1.0000	−.1944	.0884	−.3225	−.1224
STUDENT TEACHER RATIO	−.2619	−.3939	−.2641	−.4850	−.0998	−.1746	−.0250	−.1222	.2076	−.1811	−.1944	1.0000	.3913	.0580	.0348
FACULTY WITH PH.D.	.3124	.0181	.2040	.0313	−.3390	.1915	.2019	.1998	.3310	−.3897	.0884	.3913	1.0000	−.0718	.0878
PERCENT TEACHER BACHELORS DEGREES	−.4010	−.4915	−.4822	−.1175	.4713	−.5530	−.5224	−.5540	−.4122	−.5024	−.3225	.0580	−.0718	1.0000	.3475
PERCENT TEACHER GRADUATE DEGREES	.3116	−.2993	−.2132	−.0291	.0488	−.1729	−.1850	−.1814	−.1546	−.0935	−.1224	.0348	.0878	.3475	1.0000

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APPENDIX TABLE D–3.—*Private religious schools with graduate programs*

N=62

	VERBAL MEAN	MATH MEAN	EXPENDITURES	TUITION	PERCENT GRADUATE SCHOOL	NUMBER OF PH.Ds 1920–60	NUMBER OF PH.Ds 1960–66	NUMBER OF PH.Ds 1920–66	ENROLLMENT	PERCENT MALE	RESEARCH STAFF	STUDENT TEACHER RATIO	FACULTY WITH PH.D.	PERCENT TEACHER BACHELORS DEGREES	PERCENT TEACHER GRADUATE DEGREES
VERBAL MEAN	1.0000	.8147	.2945	.5913	.3880	.3488	.3099	.3398	.1427	.0653	.0908	−.2097	.3150	−.2678	−.0017
MATH MEAN	.8147	1.0000	.2396	.6336	.5232	.5382	.5556	.5569	.3760	.5207	.1719	.0099	.3570	−.4734	.0099
EXPENDITURES	.2945	.2396	1.0000	.4442	.3518	.0923	.1282	.1094	−.0943	.0555	.3533	−.5435	.0526	−.1779	−.0185
TUITION	.5913	.6336	.4442	1.0000	.3907	.4735	.3801	.4441	.1830	.2610	.0840	−.1079	.4244	−.2691	.0987
PERCENT GRADUATE SCHOOL	.3880	.5232	.3518	.3907	1.0000	.4412	.4008	.4335	.2615	.4265	.3400	−.2584	.0503	−.2636	.0152
NUMBER OF PH.D.s 1920-60	.3488	.5382	.0923	.4735	.4412	1.0000	.9154	.9854	.6621	.3269	.2448	.0252	.2692	−.1686	−.1054
NUMBER OF PH.D.s 1960-66	.3099	.5556	.1282	.3801	.4008	.9154	1.0000	.9705	.7397	.4324	.3214	.0672	.1811	−.2590	−.0878
NUMBER OF PH.D.s 1920-66	.3398	.5569	.1094	.4441	.4335	.9854	.9705	1.0000	.7089	.3784	.2824	.0435	.2377	−.2103	−.1002
ENROLLMENT	.1427	.3760	−.0943	.1830	.2615	.6621	.7397	.7089	1.0000	.4055	.5007	.2220	−.0998	−.2839	−.0834
PERCENT MALE	.0653	.5207	.0555	.2610	.4265	.3269	.4324	.3784	.4055	1.0000	.1898	.3158	.1250	−.5464	.1595
RESEARCH STAFF	.0908	.1719	.3533	.0840	.3400	.2448	.3214	.2824	.5007	.1898	.0000	−.1966	−.3357	−.1596	−.0502
STUDENT TEACHER RATIO	.2097	.0099	−.5435	−.1079	−.2584	.0252	.0672	.0435	.2220	.3158	.1966	1.0000	.1156	−.0535	.1432
FACULTY WITH PH.D.	.3150	.3570	.0526	.4244	.0503	.2692	.1811	.2377	−.0998	.1250	.3357	.1156	1.0000	−.1583	−.0978
PERCENT TEACHER BACHELORS DEGREES	.2678	−.4734	−.1779	−.2691	−.2636	−.1686	−.2590	−.2103	−.2839	−.5464	.1596	−.0535	−.1583	1.0000	−.1009
PERCENT TEACHER GRADUATE DEGREES	.0017	.0099	−.0185	.0987	.0152	−.1054	−.0878	−.1002	−.0834	.1595	.0502	.1432	−.0978	−.1009	1.0000

APPENDIX TABLE D-4.—*Private non-religious schools with no graduate programs*

N=32

	VERBAL MEAN	MATH MEAN	EXPENDITURES	TUITION	PERCENT GRADUATE SCHOOL	NUMBER OF PH.Ds 1920–60	NUMBER OF PH.Ds 1960–66	NUMBER OF PH.Ds 1920–66	ENROLLMENT	PERCENT MALE	RESEARCH STAFF	STUDENT TEACHER RATIO	FACULTY WITH PH.D.	PERCENT TEACHER BACHELORS DEGREES
VERBAL MEAN	1.0000	.8699	.7136	.3863	.3635	.5835	.6239	.6051	−.0756	−.3169	−.0062	−.5396	.1580	−.4344
MATH MEAN	.8699	1.0000	.5835	.1706	.4814	.7765	.7939	.7930	.1229	.0610	.1700	−.3778	.2525	−.4957
EXPENDITURES	.7136	.5835	1.0000	.5312	.3308	.4401	.5342	.4776	−.0618	−.2806	.0898	−.4837	.4256	−.4379
TUITION	.3863	.1706	.5312	1.0000	.2387	.0851	.1115	.0951	−.1208	−.2464	−.0497	−.3105	.0352	−.4596
PERCENT GRADUATE SCHOOL	.3635	.4814	.3308	.2387	1.0000	.4841	.4989	.4958	−.0347	.3702	.2076	−.1505	.2235	−.3382
NUMBER OF PH.D.s 1920–60	.5835	.7765	.4401	.0851	.4841	1.0000	.9386	.9933	.3775	.2171	.1590	−.0653	.2985	−.4429
NUMBER OF PH.D.s 1960–66	.6239	.7939	.5342	.1115	.4989	.9386	1.0000	.9722	.3567	.1366	.1918	−.0978	.2515	−.4773
NUMBER OF PH.D.s 1920–66	.6051	.7930	.4776	.0951	.4958	.9933	.9722	1.0000	.3758	.1932	.1722	−.0771	.2869	−.4606
ENROLLMENT	−.0756	.1229	−.0618	−.1208	−.0347	.3775	.3567	.3758	1.0000	.2492	−.0547	.6807	−.1327	−.0639
PERCENT MALE	−.3169	.0610	−.2806	−.2464	.3702	.2171	.1366	.1932	.2492	1.0000	.2974	.3882	.0003	−.2617
RESEARCH STAFF	−.0062	.1700	.0898	−.0497	.2076	.1590	.1918	.1722	−.0547	.2974	1.0000	.0429	.1591	−.2032
STUDENT TEACHER RATIO	−.5396	−.3778	−.4837	−.3105	−.1505	−.0653	−.0978	−.0771	.6807	.3882	.0429	1.0000	−.2738	.1521
FACULTY WITH PH.D.	.1580	.2525	.4256	.0352	.2235	.2985	.2515	.2869	−.1327	.0003	.1591	−.2738	1.0000	−.2266
PERCENT TEACHER BACHELORS DEGREES	−.4344	−.4957	−.4379	−.4596	−.3382	−.4429	−.4773	−.4606	−.0639	−.2617	−.2032	.1521	−.2266	1.0000

Appendix Table D–5.—*Private religious schools with no graduate programs*

N=80

	VERBAL MEAN	MATH MEAN	EXPENDITURES	TUITION	PERCENT GRADUATE SCHOOL	NUMBER OF PH. D.s 1920–60	NUMBER OF PH. D.s 1960–66	NUMBER OF PH. D.s 1920–66	ENROLLMENT	PERCENT MALE	RESEARCH STAFF	STUDENT TEACHER RATIO	FACULTY WITH PH. D.	PERCENT TEACHER BACHELORS DEGREES
VERBAL MEAN	1.0000	.8204	.3189	.4744	.1903	.1437	.1214	.1410	.1123	−.2971	−.1547	−.3369	.4295	−.2944
MATH MEAN	.8204	1.0000	.3441	.6520	.2839	.4621	.4488	.4740	.3721	.2337	−.1581	−.1599	.5402	−.4513
EXPENDITURES	.3189	.3441	1.0000	.3507	.2146	.1890	.3424	.2502	−.1413	−.0162	−.0775	−.5660	.2186	−.2563
TUITION	.4744	.6520	.3507	1.0000	.1927	.3212	.3036	.3265	.2843	.2234	−.0044	−.0907	.3135	−.3170
PERCENT GRADUATE SCHOOL	.1903	.2839	.2146	.1927	1.0000	.3712	.4885	.4262	.0217	.2225	−.1439	−.2829	.0742	−.2257
NUMBER OF PH.D.s 1920–60	.1437	.4621	.1890	.3212	.3712	1.0000	.8483	.9822	.5126	.4588	.0033	.0389	.2747	−.1675
NUMBER OF PH.D.s 1960–66	.1214	.4488	.3424	.3036	.4885	.8483	1.0000	.9327	.4669	.4846	.0191	−.1009	.1887	−.2715
NUMBER OF PH.D.s 1920–66	.1410	.4740	.2502	.3265	.4262	.9822	.9327	1.0000	.5149	.4845	.0090	−.0093	.2541	−.2104
ENROLLMENT	.1123	.3721	−.1413	.2843	.0217	.5126	.4669	.5149	1.0000	.3879	.2760	.4553	.0048	−.0035
PERCENT MALE	−.2971	.2337	−.0162	.2234	.2225	.4588	.4846	.4845	.3879	1.0000	.0411	.2992	.1435	−.3198
RESEARCH STAFF	−.1547	−.1581	−.0775	−.0044	−.1439	.0033	.0191	.0090	.2760	.0411	1.0000	.2717	−.1846	.0768
STUDENT TEACHER RATIO	−.3369	−.1599	−.5660	−.0907	−.2829	.0389	−.1009	−.0093	.4553	.2992	.2717	1.0000	−.1048	.2142
FACULTY WITH PH.D.	.4295	.5402	.2186	.3135	.0742	.2747	.1887	.2541	.0048	.1435	−.1846	−.1048	1.0000	−.2687
PERCENT TEACHER BACHELORS DEGREES	−.2944	−.4513	−.2563	−.3170	−.2257	−.1675	−.2715	−.2104	−.0035	−.3198	.0768	.2142	−.2687	1.0000

APPENDIX TABLE D-6.—*Private non-religious schools with graduate programs*

N=67

	VERBAL MEAN	MATH MEAN	EXPENDITURES	TUITION	PERCENT GRADUATE SCHOOL	NUMBER OF PH.Ds 1920–60	NUMBER OF PH.Ds 1960–66	NUMBER OF PH.Ds 1920–66	ENROLLMENT	PERCENT MALE	RESEARCH STAFF	STUDENT TEACHER RATIO	FACULTY WITH PH.D.	PERCENT TEACHER BACHELORS DEGREES	PERCENT TEACHER GRADUATE DEGREES
VERBAL MEAN	1.0000	.7894	.6858	.6033	.4118	.3841	.3922	.3945	.1223	−.1524	.2658	−.6628	.4176	−.4424	−.2149
MATH MEAN	.7894	1.0000	.7122	.4663	.4607	.4708	.5553	.5083	.2583	.3797	.3781	−.5966	.3041	−.4754	−.1701
EXPENDITURES	.6858	.7122	1.0000	.4872	.4791	.4957	.5559	.5256	.2032	.1751	.3900	−.6881	.2898	−.3785	−.1779
TUITION	.6033	.4663	.4872	1.0000	.1467	.2061	.1914	.2054	.0040	−.1469	.1206	−.4623	.3026	−.3852	−.2016
PERCENT GRADUATE SCHOOL	.4118	.4607	.4791	.1467	1.0000	.4882	.4738	.4932	.3167	.4723	.3298	−.3451	.2014	−.3028	.0157
NUMBER OF PH.D.s 1920–60	.3841	.4708	.4957	.2061	.4882	1.0000	.9110	.9906	.7693	.2842	.5343	−.3585	.2392	−.1932	.0223
NUMBER OF PH.D.s 1960–66	.3922	.5553	.5559	.1914	.4738	.9110	1.0000	.9588	.7696	.3789	.7021	−.3832	.2070	−.2210	−.0200
NUMBER OF PH.D.s 1920–66	.3945	.5083	.5256	.2054	.4932	.9906	.9588	1.0000	.7848	.3213	.6007	−.3738	.2333	−.2063	.0087
ENROLLMENT	.1223	.2583	.2032	.0040	.3167	.7693	.7696	.7848	1.0000	.2805	.5043	−.1385	.0009	−.0787	.1486
PERCENT MALE	−.1524	.3797	.1751	−.1469	.4723	.2842	.3789	.3213	.2805	1.0000	.2795	−.0631	−.0639	−.1875	.0504
RESEARCH STAFF	.2658	.3781	.3900	.1206	.3298	.5343	.7021	.6007	.5043	.2795	1.0000	−.3733	.0872	−.1608	−.0609
STUDENT TEACHER RATIO	−.6628	−.5966	−.6881	−.4623	−.3451	−.3585	−.3832	−.3738	−.1385	−.0631	−.3733	1.0000	−.1227	.4762	.2802
FACULTY WITH PH.D.	.4176	.3041	.2898	.3026	.2014	.2392	.2070	.2333	.0009	−.0639	.0872	−.1227	1.0000	−.0409	.0993
PERCENT TEACHER BACHELORS DEGREES	−.4424	−.4754	−.3785	−.3852	−.3028	−.1932	−.2210	−.2063	−.0787	−.1875	−.1608	.4762	−.0409	1.0000	.2578
PERCENT TEACHER GRADUATE DEGREES	−.2149	−.1701	−.1779	−.2016	.0157	.0223	−.0200	.0087	.1486	.0504	−.0609	.2802	.0993	.2578	1.0000

Appendix E.

Data for Chapter 6

Twenty-one variables were collected for a sample of one hundred and one higher educational institutions and for two sub-sets of the total sample: seventy small private liberal arts colleges and thirty-one large institutions, seven of which are publicly supported. The selection criteria for drawing the sample was simply data availability. SAT scores, enrollment data, and financial data were required for each institution for both 1961–62 and 1965–66. Some institutions were excluded solely because some piece of essential data was not available.

Definition of Variables:

Four variables for SAT scores, full-time equivalent enrollment, expenditure per full-time equivalent student, tuition per full-time equivalent student, and deficit per full-time equivalent student were used. In addition, marginal cost and mean SAT score (for the two-time frames) were used, giving a total of twenty-two variables. Table D–I shows the mean values and standard deviations of these variables for both sub-sets and for the total sample.

Achievement Variables:

SA2 is the average of the median verbal and the median math score attained by enrolled freshmen in fall, 1962.

SA6 is the corresponding average score for fall, 1966.

$CSA = SA6 - SA2$.

RSA measures the rate of change in the SAT average score over the 1962-66 period, with 1962 as base.

$$RSA = \frac{CSA}{SA2}$$

SA4 is the mean SAT score over the two time frames.

$$SA4 = \frac{SA2+SA6}{2}$$

Enrollment Variables:

EN2 is full-time opening fall degree-credit enrollment plus one-third of part-time degree credit enrollment for 1961. It measures full-time equivalent enrollment.

EN6 is the corresponding value for fall, 1965, full-time equivalent enrollment.

$$CEN = EN6 - EN2$$

REN measures the rate of change in enrollment by 1965 over the 1961 base.

$$REN = \frac{CEN}{EN2}$$

Student Cost Variables:

TU is tuition and fees for educational and general purposes received from students, as reported by higher educational institutions for academic year 1961-62, divided by full-time equivalent opening fall degree credit enrollment. It is tuition per student and excludes tuition and fees received by institutions *directly* from governmental sources.

TU6 is the corresponding measure for academic year 1965-66.

$$TU = TU6 - TU2$$

RTU measures the rate of change in tuition per student, similar to RSA and REN.

$$RTU = \frac{CTU}{TU2}$$

Institutional Expenditure Variables:

EX2 is institutional expenditure per full-time equivalent student in academic year 1961-62. Reported institutional expenditures included are current fund expenditures for:

(a) General administration and general expense.
(b) Instruction and departmental research.
(c) Libraries.
(d) Operation and maintenance of physical plant.

EX6 is the corresponding expenditure per student value for academic year 1965-66.

$$CEX = EX6 - EX2$$

REX measures the rate of change in per student expenditure relative to the 1961-62 base.

$$REX = \frac{CEX}{EX2}$$

D2 is $(EX2 - TU2)$ and approximates the institutional deficit per full-time equivalent student for student education in academic year 1961-62.

D6 is the corresponding deficit per student value for academic year 1965-66.

$$CD = D6 - D2$$

RD measures the rate of change in the deficit per student relative to base year 1961-62.

$$RD = \frac{CD}{D2}$$

MC is the marginal cost to the institution of providing educational services for increments in full-time equivalent student enrollment.

$$MC = \frac{[(EX6)(EN6)] - [(EX2)(EN2)(PF)]}{CEN}$$

Where PF is
the percentage change in teacher salaries from 1961 to 1965. This measures the change in cost of services.

Data Sources:

For Achievement Variables: [1]

Manual of Freshman Class Profiles, Princeton: College Entrance Examination Board, 1962 Edition, and 1967–69 Edition.

For Enrollment Variables:

Opening Fall Enrollment in Higher Education, Washington: National Center for Educational Statistics. (1961 and 1965 issues).

For Student Cost and Institutional Expenditure Variables:

Higher Education General Information Survey, National Center for Educational Statistics, Forms for Academic Years 1961-62 & 1965-66.

APPENDIX E.—*Regression equations*

SAMPLE OF SMALL SCHOOLS, N = 70	SAMPLE OF LARGE SCHOOLS, N = 31	ALL SCHOOLS, N = 101
Percent Increase in Enrollment Related to Mean of 1962 & 1966 SAT Scores		
1. $REN = -.1149\,(MSA) + 87.5$ (.035) $R = .37$	$REN = -.1329\,(MSA) + 102.4$ (.038) $R = .54$	$REN = -.1108\,(MSA) + 86.5$ (.026) $R = .40$
Expenditure Per Student Related to SAT Scores for 1962 and 1966		
2. $EX2 = 6.736\,(SAT2) - 2{,}154$ (.754) $R = .73$	$EX2 = 9.044\,(SAT2) - 3{,}364$ (1.596) $R = .72$	$EX2 = 7.6379\,(SAT2) - 2{,}614$ (.688) $R = .74$
3. $EX6 = 9.181\,(SAT6) - 3{,}407$ (.924) $R = .77$	$EX6 = 14.095\,(SAT6) - 6{,}111$ (2.044) $R = .79$	$EX6 = 11.1709\,(SAT6) - 4{,}480$ (.899) $R = .78$
Difference of Expenditures and Tuition Related to SAT Scores for 1962 & 1966		
4. $D2 = 2.9021\,(SAT2) - 1{,}139$ (.651) $R = .48$	$D2 = 6.279\,(SAT2) - 2{,}684$ (1.764) $R = .55$	$D2 = 4.6929\,(SAT2) - 2{,}003$ (.729) $R = .54$
5. $D6 = 4.005\,(SAT6) - 1{,}854$ (.900) $R = .47$	$D6 = 9.808\,(SAT6) - 4{,}720$ (2.148) $R = .65$	$D6 = 6.9925\,(SAT6) - 3{,}390$ (1.0032) $R = .57$

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[1] Fall 1962 and for 1966 SAT scores were used to relate to academic years 1961–62 and 1965–66 respectively on the assumption that expenditure and tuition policies of the preceding school year best explain achievement levels of entering freshman for the subsequent school year.

TABLE E–1.—*Mean and Standard Deviation for Total Sample and Four Subsets*

Variable	ALL SCHOOLS N =101		SMALL SCHOOLS N =70		LARGE SCHOOLS N =31		LARGE PRIVATE SCHOOLS N =24		LARGE PUBLIC SCHOOLS N =7	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
EN2	2988	4123	1071	751	7317	5201	5792	2750	12545	7651
EN6	3661	5044	1312	973	8966	6336	6929	3251	15950	8863
CEN	673	1013	241	286	1649	1337	1137	776	3405	1366
REN	24	17	24	18	24	14	20	12	35	17
EX2	1775	694	1409	513	1896	703	2070	772	1622	460
EX6	2171	966	1685	647	2332	999	2655	1130	1851	445
CEX	396	441	276	267	436	506	585	581	229	170
REX	22		20		23		28		14	
TU2	880	388	1020	355	834	388	1085	203	436	255
TU6	1116	512	1323	453	1048	512	1395	303	531	262
CTU	236	226	303	188	214	344	310	205	95	90
RTU	27		30		26		29		21	
D2	895	653	389	393	1063	635	985	720	1186	442
D6	1055	831	362	454	1284	799	1260	972	1320	428
CD	160	374	−27	247	221	372	275	451	134	163
RD	18		−7		21		28		11	
SA2	562	61	536	61	570	59	600	48	522	39
SA6	586	57	562	58	594	55	619	52	558	36
CSA	24	25	26	28	24	24	19	25	36	11
RSA	4		5		4		3		7	
SA4	574		549		582		610		540	
MC	1611	3108	971	1671	1822	3427	2366	4614	1200	305

Higher Educational Institutions in Sample

Institution	*State*
Seventy Liberal Arts Colleges:	
Albright	Pennsylvania
Bard	New York
Bennington	Vermont
Bowdoin	Maine
Bryn Mawr	Pennsylvania
Centre	Kentucky
Cedar Crest	Pennsylvania
Chatham	Pennsylvania
Citadel	South Carolina
Coe	Iowa
College of Mt. St. Vincent	New York
Connecticut College	Connecticut
Cornell	Iowa
Davidson	North Carolina
Dickinson	Pennsylvania
Drew	New Jersey
D'Youville	New York
Earlham	Indiana
Eastern Baptist	Pennsylvania
Elmhurst	Illinois
Elmira	New York
Furman	South Carolina
Goucher	Maryland
Greensboro	North Carolina
Gustavus Adolphus	Minnesota
Hanover	Indiana
Haverford	Pennsylvania
Hiram	Ohio
Hobart	New York
Hofstra	New York
Hood	Maryland
Lafayette	Pennsylvania
Lake Forest	Illinois
Lawrence	Wisconsin
Lebanon Valley	Pennsylvania
Manhattanville	New York
Merrimack	Massachusetts
Millikin	Illinois
Mt. St. Mary	California
Ohio Wesleyan	Ohio
Pomona	California
Pratt Institute	New York
Providence	Rhode Island
Randolph Macon	Virginia
Ripon	Wisconsin
Rosary	Illinois
Rosary Hill	New York
Skidmore	New York
St. Joseph	Maryland
St. Mary of the Woods	Indiana
Shimer	Illinois
Stonehill	Massachusetts
Swarthmore	Pennsylvania
Sweet Briar	Virginia
Trinity	Connecticut
Trinity	Texas

Institution	*State*
University of Portland	Oregon
University of Redlands	California
University of the South	Tennessee
Valparaiso	Indiana
Wellesley	Massachusetts
Wells	New York
Wesleyan	Georgia
Westmont	California
Williams	Massachusetts
Wilson	Pennsylvania
Winthrop	South Carolina
Wofford	South Carolina
Carleton	Minnesota
Middleburg	Vermont

Thirty-One Large Institutions:

Institution	*State*
Catholic	D.C.
Clark	Massachusetts
Cornell	New York
Duke	North Carolina
Duquesne	Pennsylvania
Fordham	New York
Georgetown	D.C.
George Washington	D.C.
Johns Hopkins	Maryland
Lehigh	Pennsylvania
Pennsylvania State	Pennsylvania
Princeton	New Jersey
Rice	Texas
Southern Methodist	Texas
Stanford	California
Tufts	Massachusetts
Tulane	Louisiana
University of Denver	Colorado
University of Michigan	Michigan
University of Oregon	Oregon
University of Pennsylvania	Pennsylvania
University of Pittsburgh	Pennsylvania
University of Rochester	New York
University of South Carolina	South Carolina
University of Texas	Texas
University of Vermont	Vermont
University of Virginia	Virginia
Vanderbilt	Tennessee
Washington University	Missouri
Western Reserve	Ohio
Yale	Connecticut

Appendix F. Financial Assistance Requirements

The total need for assistance in the financing of the cost of higher education for full-time undergraduate students, the difference between total student costs and total family contribution, was estimated on three alternative bases in the model for Low and High enrollment projections.

Needs based on mean expenditures.—Mean costs reported by full-time students for Project Talent by sex were calculated for each of the four income groups (table F–1), and mean parental contributions expected of parental support for college expenses for families with two children[1] were calculated for each income quartile from the College Scholarship Service (table F–2).

The estimated college costs from Project Talent were in 1960 dollars, and these were incremented at an annual rate of 6 percent for tuition expenses and at 2 percent for living costs. Parental incomes were allowed to grow at 5 percent annually, assuming a 2 percent rate of inflation. Parental contributions, in 1966 dollars, were incremented at a varying annual ratio as shown in Table F–2 in such a way that the 1966 proportion of the real income was actually set aside for college expenses.

The gap, $g_{t,i}$, was calculated as follows:

Let

$$T_{t,s,i} = \sum_{J} {}^{T}C_{s,i} \cdot E_{s,t,i,J} \cdot (1+r_T)^t$$

$$L_{t,s,i} = \sum_{J} {}^{L}C_{s,i} \cdot E_{s,t,i,J} (1+r_L)^t$$

$$K_{t,s,i} = \sum_{J} P_i \cdot \sum_{s} E_{s,t,i,J} (1+r_K)^t$$

Then

$$g_{t,i} = \sum_{s} T_{t,s,i} + L_{t,s,i} - K_{t,s,i}$$

If T + L − K was O, then T + L − K was made = O.

T = Tuition cost by sex and income quartile.

L = Living cost.

K = Parental contribution by year, second income quartile.

E = Estimated enrollment by year, sex, income, and aptitude.

C = Student costs for tuition or living expenses as indicated in the superscript.

P = Parental contribution.

TABLE F–1.—*Mean student costs by sex and income quartile*

Income Quartile	Male: Tuition Expense	Male: Living Cost	Female: Tuition Expense	Female: Living Cost
Low........	319	559	290	509
2...........	411	728	394	762
3...........	333	557	311	528
High........	401	772	397	762
Annual........ Increment.....	$r_T = .06$	$r_L = .02$	$r_T = .06$	$r_L = .02$

TABLE F–2.—*Parental contributions to college expenses by income quartile*

Year	Imcome Quartile: Low	2	3	High
	.22	.07	.08	.014
1966.......	$ 20	$ 750	$1,360	$3,500
1967.......	25	795	1,458	3,565
1968.......	35	843	1,633	3,630
1969.......	43	898	1,730	3,698
1970.......	56	977	1,887	3,767
1971.......	68	1,071	2,023	3,836
1972.......	82	1,158	2,134	3,908
1973.......	96	1,297	2,281	3,980
1974.......	111	1,319	2,464	4,054
1975.......	120	1,410	2,751	4,129
1976.......	149	1,532	2,869	4,205

Distribution of college-enrolled male and female students by tuition cost and living expenses were calculated from Project Talent data. These distributions are given in Tables F–3 and F–4. On the assumption that students who pay the lowest tuition also have the lowest living cost, 16 combined tuition-living cost curves were calculated for men and women by quartile.

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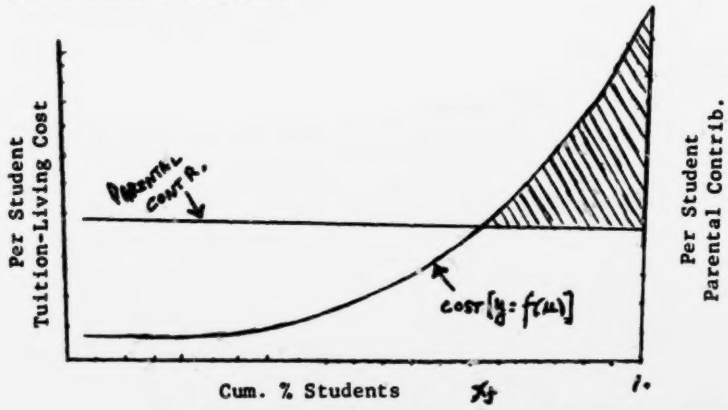
[1] Financing a College Education. *A Guide for Counselors.* 1966. College Entrance Examination Board.

An exponential curve of the form:
$y\ ae^{bx}$
(where x Percentile scale
y Combined cost per student)
was fitted to each of the 16 cost curves, and the "GAP" was then recalculated on the following basis:

Given the two cumulative curves on the graph below, representing the combined student costs and the parental contribution, the shaded area represents the total gap between student costs and parental contribution.


Per Student Tuition-Living Cost
PARENTAL CONTR.
COST [y: f(u)]
Per Student Parental Contrib.
Cum. % Students
x_t
1.

The "GAP" in a given income quartile is the sum of the gaps calculated for men and women in that income quartile, by the equation:

$$g_{t,i} = E_{t,i} \sum_{s} \left(\int_{x_t}^{1.0} f(u)_{s,i}\, du - (1 - x_t) P_i \right)$$

TABLE F–3.—*Distribution of College-Enrolled Students by Sex, Family Income Quartile, and Tuition Expenses*

Tuition Expense	Male				Female			
	Income Quartile 1	2	3	4	Income Quartile 1	2	3	4
50	.029	.024	.022	.018	.032	.027	.020	.012
75	.090	.069	.060	.039	.076	.054	.060	.041
150	.146	.124	.106	.085	.141	.102	.111	.075
250	.195	.162	.130	.117	.173	.369	.154	.103
400	.166	.197	.207	.175	.216	.156	.201	.166
625	.145	.115	.130	.130	.152	.106	.126	.129
875	.129	.142	.128	.125	.092	.090	.135	.139
1250	.082	.134	.157	.190	.108	.080	.144	.202
1500	.017	.034	.060	.123	.011	.016	.049	.134

TABLE F–4.—*Distribution of College-Enrolled Students by Sex, Family Income Quartile, and Living Costs*

Living Costs	Male				Female			
	Income Quartile 1	2	3	4	Income Quartile 1	2	3	4
300	.428	.373	.331	.216	.439	.383	.288	.201
400	.209	.162	.163	.142	.239	.192	.179	.147
625	.207	.250	.232	.195	.229	.245	.260	.222
875	.110	.143	.173	.213	.066	.127	.181	.221
1250	.041	.062	.084	.170	.023	.043	.074	.152
1750	.001	.007	.013	.044	.001	.007	.013	.037
2250	.001	.002	.003	.013	.003	.001	.004	.013
2750	.000	.001	.000	.004	.000	.001	.001	.002
3000	.000	.002	.002	.004	.000	.001	.001	.006

Student costs and the financial grap were calculated on the basis of a third set of alternative assumptions as follows:

The number of students in the lower and upper two-year levels in all institutions were calculated from ratios obtained from Project Talent data and from projections of full-time undergraduate students.

TABLE F-5.—*Full-time Undergraduate Student in all Institutions in Academic Level*

Income Quartile	Lower 2-Years	Upper 2-Years
Low...............	.70	.30
2..................	.65	.35
3..................	.60	.40
4..................	.55	.45

Average student costs were calculated from cost estimate given in Table A–6 of *Students and Buildings*[2] and the entries in Table F–5 above by the equation.

$$\bar{c}_{i,m} = \sum d_{i,j} \cdot c_{j,m}$$

where c= average cost, d= the entries in Table F–5 and c= the cost factors from *Students and Buildings* (see Tables F–6 and F–7)

TABLE F-6 —*Assumed Cost Factors*

Academic Level	Tuition m = 1	Living Exp. m = 2
Lower 2-yrs...........	$103	$1,000
Upper 2 yrs...........	278	1,283

TABLE F-7.—*Average Student Costs*

Income Quartile	Tuition	Living Exp.
Low...............	$156	$1,084
2..................	164	1,100
3..................	173	1,112
4..................	182	1,175

The projected student costs for each year by income quartile may be calculated from the above by the equation:

$$C_{t,i} = \sum_{m} E_t \cdot \bar{c}_{i,m} \cdot (1+r_m)^t$$

and as above the gap, $g_{t,i}$, is calculated as the difference between student costs and parental contribution.

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[2] *Students and Buildings,* U.S. Department of Health, Education, and Welfare, U.S. Office of Education, Government Printing Office, Washington, D.C., 1968.

Appendix G. Price Indices for Educational Expenditures

In order to calculate incremental costs of expanding enrollment, it may be advisable to reprice the costs of inputs for different years to eliminate the effect of price changes. In this way, it is possible to isolate the incremental utilization of resources associated with a change in output.

Two composite indices were developed for this purpose: one for current educational expenditures which include instructional wages (professional), non-instructional wages (non-professional), and other goods and services; the other was used to deflate outlays for physical plant.

An Index for Current Educational Expenditures.—The price index for current educational expenditures consisted of weighing the appropriate shares of (1) professional wages, (2) non-professional wages, (3) other operating expenses by price deflators, and (4) goods and services. The index used to adjust professional wages is based upon percentage changes in the American Association of University Professors' average compensation for the fiscal years 1962, 1964, 1966, and 1967, and should reflect the professional wage changes. The following tables list these two indices.

TABLE G–1.—*A.A.U.P. Average Compensation for Faculty Fiscal years 1962, 1964, 1966, l967*

Fiscal Year	Average Compensation	Index 1961–62 = 100
1961–62	8,693	100.0
1963–64	9,593	110.4
1965–66	10,632	122.3
1966–67	11,289	129.9

Source: A.A.U.P. Bulletin, Summer 1962, 1964, 1966, 1967.

The index used to deflate non-professional wages, and other goods and services is, for lack of anything better, that of consumer prices published by the U.S. Department of Labor. It is reproduced in Table G–2.

TABLE G–2.— *Consumer Price Index*

Year	Index 1957–59 = 100	Fiscal Year [1]	Index 1957–59 = 100	Index 1960–61 = 100
1961	104.2			
		1961–62	104.8	100.0
1962	105.4			
1963	106.7			
		1963–64	107.3	101.7
1964	108.1			
1965	109.9			
		1965–66	111.5	106.4
1966	113.1			
		1966–67	114.7	109.4
1967	116.3			

[1] Fiscal year determined by using last six months of first year plus first six months of second year or as in base year 1961–62, .5 (104.2) + .5 (105.4) = 104.8.

Source: U.S. Department of Labor, Handbook of Labor Statistics, Washington, D.C., Government Printing Office: 1968.

Weights for each item were calculated, using information from the 1961–62 and 1963–64 U.S. Office of Education's Financial Surveys of Institutions of Higher Education.

The mean outlay for professional wages for the two years was 77.5 percent of the total. This weight, .775, was used for professional wages for all years. Its complement, .225, was used as the weight for other educational expenses.

The following index of college costs was then calculated:

1961–62 = 100.0
1963–64 = 108.44
ICC, 1965–66 = 118.72
ICC, 1966–67 = 125.29

Appendix H.
Supplementary Statistical Tables

APPENDIX TABLE 4–1—*Credit Hours Costs/Student in the Oklahoma Public Higher Education System 1961–62 and 1966–67 by Level,*[1] *For Science and Non-Science, By Level (Dollar Per Credit Hour Per Student)*

Institutions	Total			Lower Science			Lower Non-Science			Upper Science			Upper Non-Science			Grad. Science			Grad. Non-Science		
	1961–62	1966–67	% Dif.	1961–62	1966–67	% Dif.	1961–62	1966–67	% Dif.	1961–62	1966–67	% Dif.	1961–62	1966–67	% Dif.	1961–62	1966–67	% Dif.	1961–62	1966–67	% Dif.
University of Oklahoma	11.68	15.95	37	8.71	13.73	58	7.26	8.75	20	15.04	23.26	55	12.49	14.79	18	35.16	55.05	57	21.82	31.72	45
Oklahoma State Univ.	11.58	14.26	23	7.7	9.5	23	7.52	8.96	19	10.93	15.47	42	12.54	15.56	24	44.14	59.67	35	48.74	62.01	27
Central State College	8.37	9.4	12	7.81	8.24	6	7.23	8.08	12	15.1	17.43	15	9.96	10.94	10	0	198	0	17.74	28.24	49
East Central State Col.	9.03	10.56	17	6.92	8.14	18	8.2	9.38	14	15.28	22.22	45	10.33	12.55	21	19.94	19	–5	12.42	20.06	61
Northeastern State Col.	7.65	9.32	22	4.89	5.9	21	7.28	8.64	19	11.48	14.33	25	8.82	11.4	29	0	0	0	10.17	9.18	10
Southeastern State Col.	8.94	11.92	33	7.67	9.29	21	7.61	9.56	26	17.48	24.33	39	11.26	15.9	41	11.69	0	0	8.97	14.91	66
Oklahoma College of Liberal Arts	16.23	13.97	–14	12.11	11.72	–3	14.54	11.26	23	20.36	22.32	10	19.39	19.84	2						
Panhandle A&M College	11.65	13.37	15	7.61	10.94	44	8.97	9.6	7	37.08	54.68	47	16.54	19.12	16						
Langston University	11.53	11.26	–2	7.46	8.77	18	9.44	9.5	1	17.82	40.92	130	17.37	14.76	–15						
Cameron State Agriculture College	8.51	9.39	10	8.53	10.27	20	8.51	9.2	8												
Connors State Agriculture College	10.03	10.88	8	9.35	10.87	8	10.15	10.89	7												
Eastern A&M College	8.64	8.9	3	8.9	10.79	21	8.55	8.39	–2												
Murray State Agriculture College	13.88	10.54	–24	14.03	12.71	–9	13.81	9.89	28												
Northeastern Okla. A&M College	8.3	8.6	4	7.85	5.42	–31	8.4	9.62	15												
Northern Oklahoma College	9.39	12.54	34	9.39	15.93	70	9.39	12.09	29												
Total	10.55	12.78	21	7.97	10.03	26	7.89	9.03	14	13.05	19.23	47	11.91	14.12	19	39.93	57.51	44	24.71	34.7	40

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[1] Levels are defined as follows: Lower—Lower Division Studies include the first two years of undergraduate study; Upper—Upper Division Studies include the second two years of undergraduate study; Graduate—All Post-Baccalaureate Studies.

APPENDIX TABLE 7–1.—*Number of Federal Fellowships and Traineeships for Graduate Students 1967 and 1968* [1]

Agency	Math	Phys. Sci.	Engin.	Biol. Sci.	Soc. Sci.	Arts & Hum.	Educ.	Other	Total
					1967				
Total	3,954	9,518	6,430	13,740	8,504	6,607	8,218	4,169	61,140
Department of HEW	1,713	5,518	2,585	11,596	7,158	6,607	8,218	3,748	47,143
OE	1,178	1,945	1,345	1,905	5,428	6,491	7,716	1,799	27,807
PHS	504	3,006	865	8,630	952	109	400	1,120	15,586
Other	31	567	375	1,061	778	7	102	829	3,750
NSF	1,485	2,441	2,305	1,701	1,087			360	9,379
NASA	432	1,426	1,303	364	145			11	3,681
AEC	324	73	131	9					537
Other Agencies		60	106	70	114			50	400
					1968				
Total	4,144	9,904	5,971	14,578	9,268	6,623	9,491	3,872	63,851
Department of HEW	1,763	5,831	2,411	12,141	7,662	6,623	9,491	3,398	49,320
OE	1,213	1,980	1,376	1,957	5,601	6,488	8,884	1,584	29,083
PHS	514	3,104	743	8,904	1,013	121	446	847	15,692
Other	36	747	292	1,280	1,048	14	161	967	4,545
NSF	1,646	2,642	2,042	1,981	1,307			384	10,002
NASA	425	1,271	1,226	342	128			15	3,407
AEC	310	70	133	9					522
Other Agencies		90	159	105	171			75	600

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[1] Exclusive of veteran's educational assistance and research assistantships.

Source: Fellowship data from Federal Interagency Committee on Education, published and unpublished material; traineeship data from agency fiscal reports and unpublished data provided by the National Institutes of Health.

APPENDIX TABLE 7–2.—*Number and Percent of Federal Graduate Stipends by Discipline FY 1965, 1967, and 1968*

	FY 1965				FY 1967				FY 1968			
	Without VA		With VA		Without VA		With VA		Without VA		With VA	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Math	4,611	8.40	4,864	7.38	3,954	6.47	4,808	5.71	4,144	6.49	5,657	5.40
Physical Science	9,750	17.76	10,855	16.48	9,518	15.57	11,088	13.16	9.904	15.51	12,685	12.11
Engineering	9,243	16.84	10,976	16.66	6,430	10.52	8,901	10.57	5,971	9.35	10,347	9.88
Biological Science	13,198	24.04	14,899	22.61	13,740	22.47	15,564	18.48	14,578	22.83	17,809	17.00
Social Science	8,765	15.97	11,543	17.53	8,504	13.91	12,200	14.48	9,268	14.52	15,812	15.10
Arts and Humanities	2,165	3.94	2,641	4.01	6,607	10.81	9,633	11.44	6,623	10.37	11,980	11.44
Education	5,419	9.87	7,784	11.91	8,218	13.44	14,709	17.46	9,491	14.86	20,983	20.03
Other	1,744	3.18	2,321	4.53	4,169	6.82	7,333	8.71	3,872	6.06	9,475	9.05
Total	54,895	100.00	65,883	100.01	61,140	100.01	84,236	100.01	63,851	99.99	104,748	100.01

Source: Fellowship data from Federal Interagency Committee on Education, *Report of the Task Force on Fellowships and Traineeships*, June, 1968; traineeship data from agency fiscal reports and unpublished data provided by the National Institutes of Health.

APPENDIX TABLE 7–3—*Total Graduate Enrollment by Discipline and Percent of Group Receiving Stipend*

	Fall 1965 Enrollment				Fall 1968 Enrollment			
	Number of Students	% of Total Enrollment by Discip.	% of stud. aided (excl. VA subsidy)	% of school aid (ending VA subsidy)	Number of Students	% of Total Enrollment by Discip.	% of stud. aided (excl. VA subsidy)	% of school aid (ending VA subsidy)
Math	20,198	3.77	22.83	24.08	22,343	3.44	18.55	25.32
Physical Science	36,506	6.82	26.71	29.73	40,447	6.23	24.49	31.36
Engineering	58,601	10.95	15.77	18.73	63,935	9.84	9.34	16.18
Biological Science	42,500	7.94	31.05	35.06	49,309	7.59	29.56	36.12
Social Science	85,325	15.94	10.27	13.53	102,569	15.79	9.04	15.41
Arts and Humanities	62,765	11.72	3.45	4.21	78,891	12.14	8.40	15.19
Education	150,504	28.11	3.60	5.17	190,180	29.27	4.99	11.03
Other	78,933	14.74	2.21	2.94	102,023	15.70	3.80	9.29
Total	535,332	99.99	10.25	12.31	649,697	100.00	9.83	16.12

APPENDIX TABLE 7–4.—*Graduate Student Aid from Federal Fellowship and Training Grant Programs, by Agency: Fiscal Years 1967 and 1968*

(Amounts in millions)

Agency	[1]FY 1967	[1]FY 1968
Graduate Student Stipends [1]	208.5	220.8
Department of Health, Education, & Welfare	162.7	173.1
Office of Education	98.4	106.3
Public Health Service	52.3	51.8
Other	12.0	15.0
National Science Foundation	31.1	33.1
National Aeronautics & Space Administration	11.5	10.6
Atomic Energy Commission	2.1	2.1
Other Agencies	1.2	2.1

Note: Details may not add to totals because of rounding.

[1] Includes graduate student stipends from fellowships and training grants, exclusive of cost-of-education payments to institutions. Graduate student support from veterans readjustment benefits, research assistantships, and student loans are excluded.

APPENDIX TABLE 7–5.—*Average Stipends Paid Graduate Students from Federal Funds,* by Agency and Field of Study*

Agency	Math	Phys. Sci.	Engin.	Biol. Sci.	1967 Soc. Sci.	Arts & Hum.	Educ.	Other	Total
Total	$3,233	$3,118	$3,065	$ 3,258	$3,547	$3,084	$3,641	$5,052	$3,411
Department of HEW	3,012	3,031	3,074	3,204	3,650	3,084	3,641	5,140	3,451
OE	3,142	2,889	2,889	2,889	3,490	3,082	3,675	6,879	3,538
PHS	2,710	3,045	3,477	3,241	4,797	3,147	3,255	4,079	3,354
Other	3,000	3,444	2,803	3,467	3,365	3,571	2,559	2,800	3,200
NSF	3,493	3,269	2,978	3,617	2,982			4,475	3,319
NASA	3,121	3,121	3,121	3,122	3,120			3,111	3,121
AEC	3,355	4,671	3,924	12,889					3,832
Other Agencies		3,000	3,000	3,000	3,000			3,000	3,000
					1968				
Total	$3,327	$3,185	$3,107	$ 3,257	$3,686	$3,272	$3,660	$4,919	$3,462
Department of HEW	3,183	3,144	3,145	3,202	3,821	3,272	3,660	4,978	3,510
OE	3,367	3,129	3,129	3,129	3,701	3,272	3,693	6,842	3,656
PHS	2,745	3,065	3,296	3,174	4,775	3,248	3,343	3,924	3,301
Other	3,222	3,513	2,836	3,507	3,544	3,357	2,702	2,848	3,302
NSF	3,471	3,259	2,972	3,556	2,973			4,745	3,314
NASA	3,120	3,121	3,121	3,123	3,117			3,133	3,121
AEC	3,661	4,500	3,895	13,111					3,996
Other Agencies		3,500	3,500	3,500	3,500			3,500	3,500

* Exclusive of veteran's educational assistance and research assistantships.

APPENDIX TABLE 9–1.—*Financial Need Calculated on the Basis of Average Reported Expenditures*

(Millions)
Income Quartile

Year	Enrollment Assumption	Low	2	3	4	Total
1966....	Low	450.2	231.3	0	0	681.5
	High	......	.....	.	.	......
1969....	Low	675.4	281.1	0	0	956.5
	High	......	.....	.	.	......
1970....	Low	748.5	273.0	0	0	1021.4
	High	975.9	415.1	0	0	1390.9
1971....	Low	827.8	252.4	0	0	1080.1
	High	1056.8	381.6	0	0	1438.4
1972....	Low	912.6	237.5	0	0	1150.1
	High	1147.7	359.2	0	0	1506.9
1973....	Low	994.3	170.0	0	0	1164.2
	High	1235.8	257.2	0	0	1492.9
1974....	Low	1073.9	215.3	0	0	1489.2
	High	1322.9	324.0	0	0	1646.8
1975....	Low	1159.4	192.9	0	0	1352.3
	High	1419.5	290.1	0	0	1709.6
1976....	Low	1228.0	139.5	0	0	1367.5
	High	1497.4	210.8	0	0	1708.2

Source: OPPE model.

APPENDIX TABLE 9–2.—*Financial Need Calculated on the Basis of Minimum Adequate Requirements*

(Millions)
Income Quartile

Year	Enrollment Assumption	Low	2	3	4	Total
1966.....	Low	687.6	471.5	183.2	0	1342.2
	High	....	....	....	....	....
1969.....	Low	1004.0	574.2	0	0	1578.2
	High	....	....	....	....	....
1970.....	Low	1103.0	578.7	0	0	1681.7
	High	1431.3	877.8	0	0	2309.1
1971.....	Low	1208.6	571.0	0	0	1779.6
	High	1535.6	860.4	0	0	2396.0
1972.....	Low	1319.6	568.1	0	0	1887.6
	High	1651.4	854.8	0	0	2506.2
1973.....	Low	1423.4	508.7	0	0	1932.0
	High	1760.5	763.1	0	0	2523.5
1974.....	Low	1521.9	558.8	0	0	2080.6
	High	1865.5	834.6	0	0	2700.0
1975.....	Low	1623.4	538.1	0	0	2161.4
	High	1977.8	801.6	0	0	2779.4
1976.....	Low	1705.7	483.2	0	0	2188.8
	High	2069.2	719.8	0	0	2789.0

Source: OPPE model.

APPENDIX TABLE 9–3.—*Financial Need Calculated on the Basis of Reported Cumulated Expenditures*

(millions)
Income Quartile

Year	Enrollment Assumption	Low	2	3	High	Total
1966..................	Low	470.5	234.2	263.5	34.9	1003.0
	High	....	....	....	....	....
1969..................	Low	704.5	307.1	273.2	66.0	1350.7
	High	....	....	....	....	....
1970..................	Low	780.2	320.6	265.3	82.4	1448.5
	High	1014.4	486.1	328.4	81.0	1909.8
1971..................	Low	862.2	331.8	271.4	102.2	1567.4
	High	1097.7	499.5	333.9	100.4	2031.4
1972..................	Low	949.7	347.0	289.2	125.3	1711.0
	High	1190.9	521.6	354.1	123.3	2189.8
1973..................	Low	1033.8	339.3	292.7	150.3	1816.0
	High	1281.2	508.4	356.8	148.0	2294.3
1974..................	Low	1115.7	380.2	280.1	177.2	1953.1
	High	1370.5	567.1	340.0	174.5	2452.0
1975..................	Low	1203.3	392.2	246.4	206.6	2048.3
	High	1469.0	583.5	298.2	203.5	2554.1
1976..................	Low	1273.9	391.2	265.2	243.9	2174.0
	High	1548.8	581.9	320.3	240.3	2691.2

Source: OPPE model.

APPENDIX TABLE 9-4.—*Excess of Actual Estimated Expenditures over Minimum Adequate Level First and Second Income Quartiles*

(Millions)

Income Quartile

Year	Enrollment Assumption	Low	2	Total
1966.......	Low	74.7	82.1	156.8
	High	....		
1969.......	Low	122.3	125.9	248.2
	High	....		
1970.......	Low	139.9	142.3	282.2
	High	181.4	215.5	396.9
1971.......	Low	161.3	161.0	322.3
	High	205.0	242.1	447.1
1972.......	Low	185.12	183.3	368.5
	High	232.0	275.2	507.2
1973.......	Low	209.9	207.4	417.3
	High	260.1	310.4	570.5
1974.......	Low	235.7	232.8	468.5
	High	289.5	347.0	636.5
1975.......	Low	262.8	259.8	522.6
	High	321.1	386.2	707.3
1976.......	Low	291.6	288.4	580.0
	High	355.0	428.7	783.7

Source: OPPE model.

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